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The Lesson of Fire.

It is never out of place to consider the conditions under which destructive fires occur. The danger of fire is one to which all persons and all property are exposed, and everything pertaining to a great conflagration is of universal interest. A calamity most remarkable, and almost unparalleled for its magnitude and severity and sweeping completeness of destruction, was that of the recent fire at Hoboken, whereby the piers, warehouses and merchandise, the entire passenger and freight handling plant at this port of one of the great international transportation companies, was obliterated, with the loss of three fine steamships of the North Atlantic service, and probably more than 200 human lives. No one had imagined such a catastrophe as among the possibilities. The event seems to be generally regarded as one that could not have been foreseen and provided against, and there is apparently little disposition to regard the company upon whom alone the pecuniary loss must fall as deeply to blame in the matter.

This being so, it is quite astonishing how many circumstances combined to accomplish the completeness of the disaster we are considering, and how clearly the malignant capability of each of these circumstances stands revealed after the event. The thing that none could anticipate is easily explicable and is seen to be naturally consequential upon looking backward upon it. If it may have been a wonder that it occurred, we may say that it would have been as great a wonder if it had not occurred. With the combination of conditions which actually existed it would seem that the thing which happened was not merely what might have happened, but what should have happened, and we may almost say that it was what must have happened sooner or later.

Here were piers, say, an eighth of a mile long, each covered to the full width of it with a high shed or warehouse of wood. The decks or floors of the warehouses were carried on wooden spiles, and were some feet above the water, giving the freest and fullest access of air under the entire flooring. At the shore end the warehouses were connected the one with the other, making one continuous structure, with practically no partitions within. These warehouses contained large quantities of merchandise, and among it such inflammable, quickly burning and fire-spreading material as cotton, turpentine and whisky. This was stored at the sides of the sheds, leaving a driveway, or an air passage, through the middle of each pier. In the slips, tied to the sides of the piers, were the four large steamships, and the spaces not occupied by the steamers was mostly filled by lighters loading or unloading. Here, then, was an immense collection of combustibles arranged under the most perfect conditions for rapid burning. A match, or a spark, and a high wind, a touching of the button, and the conflagration is under full way, and the fire fiend laughs at the pumps and the hose that may exist somewhere for "protection."

When such a fire occurs the steamers have only to let go and slip out into the stream and be safe, and as they are built of steel they will not burn much, anyway. But how different was the actual experience. When in port there is no alert organization and no instantaneous, concerted and directed action of the crew, as is understood to prevail at sea. The fire drill is not for port conditions. The steamers are tied to the piers with wire cables that cannot be readily cut, instead of with hemp ropes. The boilers and engines are being overhauled preparatory to the next trip, so that the screw cannot turn, and no steamer can move itself an inch. As to the vessel being made of iron, so is a stove; and the ship becomes a glowing furnace, with human bodies as a part of the combustible contents, and then, most horrible of all the circumstances of the case, those little portholes through which not even a child could pass to life and safety.

There are so many lessons in this horror that it is useless for us to attempt to mention them specifically. There were so many conditions which might have been reversed or modified and made to count for safety rather than for destruction. Our eyes are opened to the conviction that there are other possibilities of disaster not remote as to location that require immediate looking after, but it is not easy to say who should do it, nor easy to believe that much will be done.

Foremen and Draftsmen Wanted.

Our issue of Jan 4 last contained an editorial in which we analyzed and compared the growth of the help wanted advertisements in our columns for the years 1897, 1898 and 1899, the figures showing a steady and continuous growth of these advertisements, which we took to be an index of the growth of activity in the machine building industries. There is, no doubt, a lull in this activity at the present time, but it is a curious fact, which we are unable to fully explain, that the growth of this class of advertising still continues. We reproduce below some of the figures published in the January 4 issue, and have added to them corresponding figures for the first two quarters of the present year—last week's issue being, however, included in the second quarter of this year. As the figures given show the average per issue, and not the total for each quarter, this introduces no error, but serves to bring the figures closer up to date.

The following table gives the average number of help wanted advertisements per issue for 1899 and for the first two quarters of 1900:

First quarter, 1899	11.6
Second quarter, 1899	13.
Third quarter, 1899	17
Fourth quarter, 1899	18.5
First quarter, 1900	20.8
Second quarter, 1900	23.2

A conspicuous feature of these advertisements of late, and one which may in a measure explain their continual growth, is the increased number of them which call for foremen and draftsmen. In counting those which call for foremen we have not restricted ourselves to those using that word, but have counted all which call for someone to take charge of work—such calls ranging up to those for superintendents and mechanical engineers. We have not included draftsmen in this category unless the call has been for a foreman draftsman or a responsible designer, and in such cases the calls have been added to counts for both draftsmen and foremen.

The second table gives a comparison of the number of advertisements for foremen and draftsmen, with the total number of advertisements for help wanted:

	Average total ads. per issue	Average ads. per issue for foremen		for draftsmen	
		No.	%	No.	%
First quarter, 1900	20.8	8.5	41.	5.1	24.5
Second " "	23.2	8.6	37.1	6.3	27.2

While the figures for a single issue have no such value as those for an extended period, it is nevertheless worth while to call attention to the fact that in our last week's issue, out of a total of 33 advertisements, 22, or 66⅔ per cent., were for foremen.

This comparison shows most pointedly the dearth of capable leadership talent that, as we have said before this, exists in the machine shops of this country, and at the same time it shows the field for usefulness and the opportunities for advancement that lie before the ambitious young mechanic. We are fully persuaded that this is to-day the best field that exists for capable and energetic boys whose future depends upon themselves, and if, as we all believe, the expansion of American industries has but just begun, the field cannot but enlarge as time goes on. With the existing excellent facilities for self-education through correspondence and other schools, and with these opportunities for advancement open before him, the young mechanic who does not advance can have but himself to blame. The drawing board, for instance, is a distant goal to many an ambitious young mechanic, while most capable superintendents prefer, if possible, to fill the ranks of their corps of draftsmen from their own shop—if for no other reason than that men from that source are already familiar with the products and methods of the works. The instruction in drawing and allied subjects given by these correspondence schools is in the highest degree satisfactory, and it only requires the necessary perseverance and application for any capable young mechanic to fit himself for the next vacancy in the drawing office.

New Zealand.

It was just sixty years ago that Macauley, in one of the most high-sounding paragraphs to be found in all his writings—that in which he adds figure to figure to characterize the perennial vitality of the Roman Catholic Church—closed with an allusion to the time "some traveler from New Zealand shall, in the midst of a vast solitude, take his stand on a broken arch of London Bridge to sketch the ruins of St. Pauls." New Zealand is to Americans of to-day somewhat less a land of wild beasts and cannibals than Macauley evidently thought it, and rumors from time to time reach us of advanced social and political systems there prevailing. But few seem to take the place very seriously, and its name is seldom mentioned among the foreign countries in which a market is being developed for American machinery and other merchandise.

We have recently enjoyed a long conversation with a gentleman from that country, Mr. K. Bassett, of the hardware house, Edward Reese & Sons, at Christchurch, who has been traveling through the United States. The talk was a fruitfully suggestive one. To begin with, it may be said that New Zealand is about the most progressive country in Australasia. She is favored by a more equable climate than that of Australia, where the variations between heat and cold are more like those in America. But especially were we impressed with the fact that the country contains both coal and iron. The coal is hard, is pronounced unexcelled in the world and is deposited in practically inexhaustible quantities. In the province of Taranaki, at the north, are iron-bearing sands which have not yet been developed, but which experts say could profitably be worked, and which the government is taking measures to develop. It is well known that the existence of coal and iron in contiguity, or easy reach of each other, determines to a great extent the industrial future of a country—witness England, Pennsylvania, Northern Alabama, and more recently certain portions of Canada. The coal and iron in New Zealand are some 400 miles apart, it is true, but they are separated mostly by water, which facilitates transportation. Now, without entering into the question whether there may not be coal and iron near together elsewhere in that part of the Orient, we venture to suggest that there may be a remarkable industrial future in store for New Zealand; that she is destined to become the manufacturing center for the vast and populous neighboring lands—in short, the Pennsylvania of Australasia!

But to return to our muttons. Mr. Bassett is a New Zealander born. This is his first trip in America. He landed in San Francisco and traveled East, leaving New York July 7 on the "Etruria," after having been in the city about a week. While in this country he visited the principal hardware companies. He was especially struck by the performances of our automatic machinery—of a machine, for instance, that could be attended to by an unskilled hand, and yet perform a dozen different operations on the piece it was working. Mr. Bassett expects to spend several months in the British Isles and to examine engineering matters there. He said in substance:

"The industrial prospects in New Zealand are excellent and, in fact, have never been better than at present. The country could easily use more capital than it has, yet wages and prices are good. The people are extensively engaged in agriculture and in sheep raising, but the resources of the country are not yet fully developed. The manufacturing and engineering industries are making progress. There is some mining of coal and washing of gold on the west coast and in Otago, one of the Southern provinces. Woolen clothing manufacture is a flourishing industry in New Zealand. The manufacture of agricultural implements and machinery of the less complicated types is carried on. The plows made there are considered equal to any in the world and are exported to Australia. The more elaborate machinery for agricultural purposes is brought from abroad; for instance, McCormick harvesters are imported from Chicago. Prominent among agricultural implement makers in New Zealand are P. & D. Duncan, of Christchurch, and Reid & Gray, of Dunedin and Christchurch. The product of the latter firm is so well known that it finds a market in Australia. Scott Brothers, of Christchurch, make stoves and ranges. They also construct steel bridges and boilers, do general repairing and have on several occasions built small river steamers. A firm which deals largely in machinery is Morrow, Bassett & Co., of Christchurch. They sell American road carts, cider presses, bicycles of the Sterling make, etc. It might occasion some surprise to see the quantity of American machinery handled by some of the principal importing houses in New Zealand.

"All the larger cities have electric light plants. There are railroads and tramways. The street railways are electric ones in Dunedin and Aukland. In other cities they are cable or steam driven, usually the latter. The Government, which controls the railroads, as it does also various other public works which in some countries are in private hands, has large workshops, where cars, locomotives and other engines and boilers can be constructed.

"Of the hardware used in New Zealand between two-fifths and three-fifths are imported from the United States. Files come largely—chiefly, I believe—from America, the objections to these that used to exist having been overcome. About all the twist drills now used are American. Other classes of tools extensively ex-

ported to New Zealand from here are fine machinists' tools, such as calipers; also axes, saws and shovels.

"Of machine tools, such as lathes, about seven-tenths have been imported from Great Britain. The remainder come quite largely from the United States; a high-grade German tool or so being occasionally purchased. The American tools are growing in favor.

"In view of the enterprises that have been mentioned there is naturally some requirement for engines and boilers, marine and stationary, and for dynamos. The engines and boilers can be constructed at home unless large or elaborate ones are needed. Electric generators, however, are not made in the country.

"For an adequate understanding of industrial conditions in New Zealand some knowledge of the political system is necessary. The colony is a self-governing one. Among the advanced ideas that are in force, beside public control of railroads, etc., are old-age pensions for those who have lived there a certain number of years, and compulsory arbitration, which renders strikes unknown. Female suffrage prevails, and one of the cities lately had a mayoress. The government loans money for little higher a rate of interest than it charges, which has the effect of keeping private rates of interest down to a moderate figure—about 6 per cent.

"In the last few years Americans have waked up to the fact that the New Zealand market is a promising one, and they have already gained a firm foothold. In New Zealand, as elsewhere, the best results may be obtained by personal cultivation of the market.

"Merchandise shipped from the eastern part of the United States usually goes by water from New York. The route via San Francisco is shorter and is followed by the mails, but the freights that way are higher because of the long overland journey."

The fact stated by Mr. Bassett which showed most forcibly the remarkable progress in civilization that New Zealand has quietly been making is that the country has already several engineering colleges. Among the youth of the best families the study of engineering is quite in vogue.

Mr. Bassett further remarked that New Zealand is about as large as England, but the population small and not sufficient for its thorough development. The country is an inviting one to men who choose to emigrate and start in business there with some capital—the more the better. In answer to a question Mr. Bassett admitted that where a man has no capital, but is thoroughly master of a good trade, although success will come slower, the prospects for him there are probably better than in most other countries to which he might go. Persons with neither money or ability are not wanted.

Commercial Review.

New York, Saturday, July 7.

MACHINISTS' SUPPLIES AND MACHINERY.

Shop supplies are in quiet selling, as is pretty generally acknowledged. Purchases, when made, are just for the requirements of the hour. Trade is in a hot weather condition—no worse than it generally is at this time of the year, nor quite as bad. The experience is one which was skipped entirely last year, and hence has the merit of freshness. Nobody has committed suicide yet over the political campaign, so far as we have heard—nor over the supply business. Prices on engineering goods generally are softening. Small tools, like files and drills, however, are keeping pretty firm still. The consolidation of the crucible, or tool, steel makers may tend to steady the market. According to the statement of a man prominent in the councils of one of the largest firms that are expected to be in it, their intention is not to raise prices unduly, but rather to make money through the introduction of more economical methods.

We announced last week that a government commissioner from Sydney, Australia, was in this country and expected shortly to place contracts for an electric railway and lighting plant amounting to $1,000,000. Following is another piece of news which furnishes an appropriate accompaniment: Mr. W. J. Mathieson, a commissioner of steam railways from the Government of Victoria, Australia, with three or four other officials, is also in America with a view to the placing of orders for a public enterprise, which also is estimated to amount to $1,000,000. It will require a large quantity of machinery of a certain kind, but the exact nature it would be a breach of confidence for us to state just yet. It is believed that the contracts may be closed in the course of three or four weeks, in which case we hope to give more specific particulars.

The Buffalo Forge Company has sold through the Russian-American Export and Import Company sixteen of its largest combined punches and shears, which are supposed to be destined for Siberia.

The Seaboard Steel Casting Company, a concern which is locating at Chester, Pa., has lately purchased fifteen or more machine tools through a New York house. They include lathes, upright and radial drills, planers, etc., some of the tools being heavy ones.

Automatic screw machines have the call in Great Britain at present, it is said. As illustrating this is repeated a rumor that the Cleveland Machine Screw Company has lately sold a lot of thirty over there.

The American Linseed Company is to erect at Port Richmond, Staten Island, N. Y., an 800,000-bushel elevator adapted to general grain purposes. It will be built of steel, including floors and doors, and be considered fireproof. The machinery will be electric-motor driven. The Steel Storage Elevator Construction Company, Buffalo, N. Y., is the contractor for the construction, and the mechanical power transmitting, the elevating and conveying machinery will be built by the Webster Manufacturing Company, of Chicago. The company last named has just shipped eight gas engines to Japan for printing-press driving, rice plant service, etc. They have also sent a large quantity of power transmitting machinery to Lima, Peru, for a cotton mill.

The prices of power transmitting machinery, taken as a class, are weak. One company admits without hesitation, that it is making lower figures, and states that in so doing it is meeting its competitors. Another important concern says that it has yet made no important reduction, but that if business keeps on as it has been going for the last few weeks, concessions are likely; however, if trade takes a turn for the better the necessity of this may be averted. What is here said we do not intend to apply to wood pulleys of the leading makes.

Some time ago we mentioned that there was quite a little cutting of prices of wood pulleys going on in the Philadelphia market. The guilty parties in this particular were the jobbers. A meeting of manufacturers and dealers was held in that city this week with a view to improving the situation. By the time it closed the diverse elements represented had united in quite a love feast of harmony and agreed upon a restoration of prices in fact, to the basis which they had previously occupied in name, and manufacturers are quite confident that there will not be any more trouble in the Philadelphia market for the present.

Mr. G. L. Reeves, secretary of the Reeves Pulley Company, Columbus, Ind., was in town Thursday, having just arrived from Philadelphia, where he attended the meeting of wood pulley manufacturers and jobbers. Mr. Reeves remarked that a decided falling off in sales was noticeable. At the same time he characterized the wood pulley business as quite favorable on the whole, and said that the present dullness was no more than usual at this time of the year. The wood pulley market does not seem to be so quickly susceptible to disturbing influences as the iron and steel market. The political situation has had no apparent effect upon it. The export demand, Mr. Reeves pronounces the most beautiful feature of the wood pulley business, and says he would be glad to manufacture a line of goods in this country for which the demand was altogether a foreign one. In the matter of credits, for instance, trade in wood pulleys is conducted upon a very satisfactory basis abroad, payments generally being immediate. The Reeves Company has an agency in Copenhagen, with sub-agencies in Stockholm, Christiania

and elsewhere, which are making highly satisfactory returns of business. Southern cotton gins in this country are among the classes of establishments from which there is a very brisk demand for wood pulleys. In New England, however, the textile mills are not foremost as wood pulley consumers. This is partly because their equipments are not of a character which occasions frequent changes in speeds after the machinery is installed. When once they have a pulley in, they expect to keep it for the next six generations. Also, the pulleys they require are generally small ones. Wood pulleys of less than 20 inches in size constitute the sugar and salt of the wood pulley trade, on which there is relatively small profit. It may be said that the margins of profit on wood pulleys are not excessive, anyway. Mr. Reeves is of opinion that the present prices will be well maintained.

Messrs. Gay & Ward, of Athol, Mass., who succeed to the milling cutter department of the L. S. Starrett Company, started the machinery in their new shops Monday, July 2. These shops are of interest as being, perhaps, the largest in the world devoted exclusively to the manufacture of milling cutters. The main building is of brick, 140x65 feet, three stories in hight, of heavy mill construction. There is also an annex 60x65 feet, bringing up the total floor space to 33,000 square feet. Care has been used to make the shops modern and complete in every respect.

Edw. N. Hurley, president of the Standard Pneumatic Tool Company, Chicago, sailed for Europe June 30, for the purpose of establishing works in Germany and France for the European trade. They now have large works in Chippenham, near London, England, but on account of the enormous demand for their product on the continent during the last year and the steady increase of the same, they have deemed it advisable to establish additional works in the countries mentioned in order to supply the demand. Mr. Hurley will also be in attendance at the Paris Exposition, where the company has two large exhibits of pneumatic tools and appliances in the Champ de Mars and Park Vincennes. He expects to return within the course of a couple of months.

The Philadelphia Forge Company, New York office 32 Cliff street, will erect a machine shop, about 30x60 feet, and is in the market for a 48-inch, a 36-inch and two 18-inch lathes, a radial drill, cutting-off machines, emery wheels, etc.

CINCINNATI REPORT.

There is really little to be said that is new concerning machinery and machine tool enterprises in the territory of which Cincinnati is the center. Even among the larger and older established concerns there is on a genuine summer dullness, and in its most pronounced form. Many of the smaller establishments are closing down; that is, for the period represented in the next eight or ten weeks. This does not in any sense represent the conditions with the larger machine tool concerns, for as a rule they are yet at work on heavy orders placed late in the spring. One large Cincinnati concern, as an evidence of how carefully matters were planned, has on hand about 400 tons of castings. This concern feels especially gratified in the face of the agitation now on among the foundry men. In this connection an uprising on the part of that feature of the local machinery trade seems imminent. John A. Penton, of Detroit, who was here recently in the interest of the National Founders' Association and took a prominent part in the discussion over an increase in wages, is registered at the Grand Hotel at this writing. There has been no manifestation since July 1, the date on which the demand was made, but everything points to early rupture. As was stated earlier in this letter, many of the machinery concerns are closing down, or at least run-

(*Continued on page 46.*)

Quotations.

NEW YORK, Monday, July 9, 1900.

Iron—American Pig, tidewater delivery:—

Pennsylvania Irons:	
No. 1 X foundry	$18 00 @ $19 00
No. 2 X foundry	17 00 @ 18 00
No. 2 plain	16 00 @ 17 00
Alabama Irons:	
No. 1 foundry	18 25 @ 20 25
No. 2 foundry	18 00 @ 19 25
No. 3 foundry	17 50 @ 18 25
No. 1 soft	18 25 @ 20 25
No. 2 soft	18 00 @ 19 25
Foundry forge	16 25 @ 18 25

The pig iron market is unsettled, some sellers making concessions, others holding for an advance.

Bar Iron—Base sizes—The price on dock is 1.50 @ 1.60c. for good refined brands, and 2 @ 2.10c. upward for same from store.

Tool Steel—Base sizes—Good standard quality 7 @ 8c.; extra grades, 10 @ 14c.; special grades, 16c. and upward.

Machinery Steel — Base sizes — From store, 2.20 @ 2.50c.

Cold Rolled Steel Shafting—Base sizes —From store, 3¼ @ 3½c.

Copper—Lake Superior Ingot, 16¼ @ 16⅜c.; electrolytic, 16⅛ @ 16¼c.; casting, 16 @ 16⅛c.

Pig Tin—Quotations heard to-day from 31 @ 31¾c. A fair figure would 31½c., f.o.b., for 5-ton lots.

Lead—For wholesale lots, 4c., with .02½ @ .05c. extra for carloads, New York.

Spelter — Prime Western, 4.27½ @ 4.30c., New York delivery.

Antimony—Cookson's, 10¾ @ 11c.; United States, 9⅜c.

Lard Oil—Prime City, 54c. in one to five-barrel lots.

The Paris Exposition—VII.

EDITORIAL CORRESPONDENCE.

One of the Baldwin locomotives exhibited at Vincennes figures as the innocent cause of a somewhat sensational incident in the French Chamber of Deputies. A member objected not alone to the fact that a French government railway had gone to America to purchase locomotives, but especially and particularly that the administration should have this American engine exhibited as it is, with the name of the road it is to run on prominently displayed, thus announcing to all the world that France has gone abroad to buy locomotives. Why, he wanted to know, do we go to America for locomotives, and thus injure a French industry which can hold its own with all the world? Whereupon M. Coutant is reported as replying: "You know very well that we cannot build such locomotives in France," and upon being tauntingly replied to, said that he was an engineer. Just why they could not build such a locomotive here if they chose to do so is something I do not understand. They certainly build very many that are at least equally difficult to construct, and in fact the Minister of Public Works, M. Pierre Baudiv, said the locomotive was ordered from America because the French builders were overloaded with orders, and was exhibited because it was considered proper for the State Railways to exhibit the latest rolling stock provided for the road, no matter where it came from.

SOME FRENCH LOCOMOTIVE WORK—SOME MILLING CUTS.

Speaking of locomotive work, the Compagnie des Chemins de fer de l'est exhibit in the department of civil engineering in the Champ de Mars some specimens of rod work and a link and block for a locomotive that no builder would need to be ashamed of. The link and block, particularly, are both hardened and beautifully finished by grinding on a special machine, a photograph of which is exhibited along with the work. They also show some things that give evidence that they appreciate milling and are prepared to do it efficiently. Two milling cutters are shown with their arbors. One of these cutters is solid, with spiral teeth of about 20 m/m (¾ inch) pitch and 250 m/m (9 13-16 inches) diameter by 400 m/m (15¾ inches) long. The other cutter is of about the same dimensions, but has inserted spiral teeth (strips of steel fitted to dovetailed grooves), and having a pitch of 36 m/m, or 1 7-16 inches. Between these two cutters is a box with glass sides, ends and top, which box contains the chips cut from mild steel with one of these cutters in ten minutes. The chips are all alike, the full length of the cutter, rolled up like straws, and their weight is given as 7 kilograms, or 15.4 pounds, which would be at the rate of 92.4 pounds per hour.

According to an appended statement of the conditions, the depth of cut was 15 m/m (9-16 inch), the feed 15 m/m (9-16 inch) per minute, speed of the circumference of the cutter 10 meters (32.8 feet) per minute.

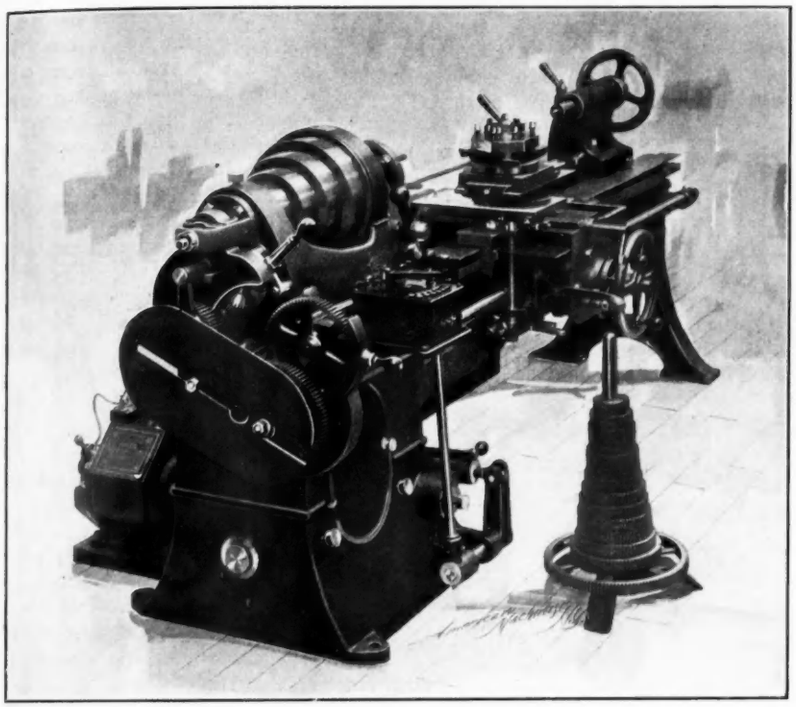


FIG. 29. ENGINE LATHE EXHIBITED BY THE WERKZEUGMASCHINENFABRIK "UNION," OF CHEMNITZ.

A GERMAN LATHE.

The Werkzeugmaschinenfabrik "Union," of Chemnitz, Germany, exhibit in the Champ de Mars only one tool, and that is a lathe, which they believe a demand can be worked up for in Europe, and which they have fitted up to manufacture in a systematic way. The general features of the lathe are well shown by Figs. 29 and 30, the last named being a view of the carriage, with extra rest supplied for turning such pieces as the one shown.

Like so many of the modern Continental machine tools, it is avowedly based upon British and American practice, with (in this case) additional ideas thought to be improvements for the market for which it is designed. It will be noticed that the flat top bed is adopted, but instead of leaving the sliding surfaces exposed, as usual, they are carried down below the top of the bed and are covered by strips of steel, which are fastened to the bed above them and project out to the edges. This, of course has the disadvantage that it increases the hight from slides to centers relatively to what the lathe will swing, and makes a cut through the carriage necessary where the strips pass through. But the advantages are considered to more than counterbalance this.

There is a turret tool-post, which is made triangular for three tools, so that when desired the cutting points of any two tools can be brought close together at the apex or one corner of the triangle, and there is a special indexing notch to hold them in cutting position when thus placed. The two tools then cut simultaneously, either with one roughing and the other finishing, or for turning two different sizes at one cut. The back gears are placed below the spindle (which, it will be noted, is not hollow), and there are the usual tumbler gears for reversing the motion of the screw train. Motion can be taken for the screw train from the back gear shaft for coarse pitch screw cutting, and when this is done the safety lock shown in position in Fig. 29 is put in place on the stud and prevents the tumbler gears from being thrown into engagement.

The lathe is especially designed so that it may be driven either by direct-connected motor or from a countershaft, as may be desired, without material alteration—in fact, none except in the base, or column. There is an automatic release for the cross feed in either direction, as well as for the carriage feed, and also an indicator for closing the nut at the proper time in screw cutting when the lathe is running.

Fig. 31 is a horizontal section through the column as supplied for motor driving. *A* is the motor, which regularly drives the cross shaft *B* with one reduction by spur gears as shown. By means of the friction clutch *C* the cone pulley is driven from shaft *B* in one direction, while by two positive clutches *D* and *E* it is driven at two different speeds in the other direction; these two last named clutches being not directly upon the shaft *B*, but upon

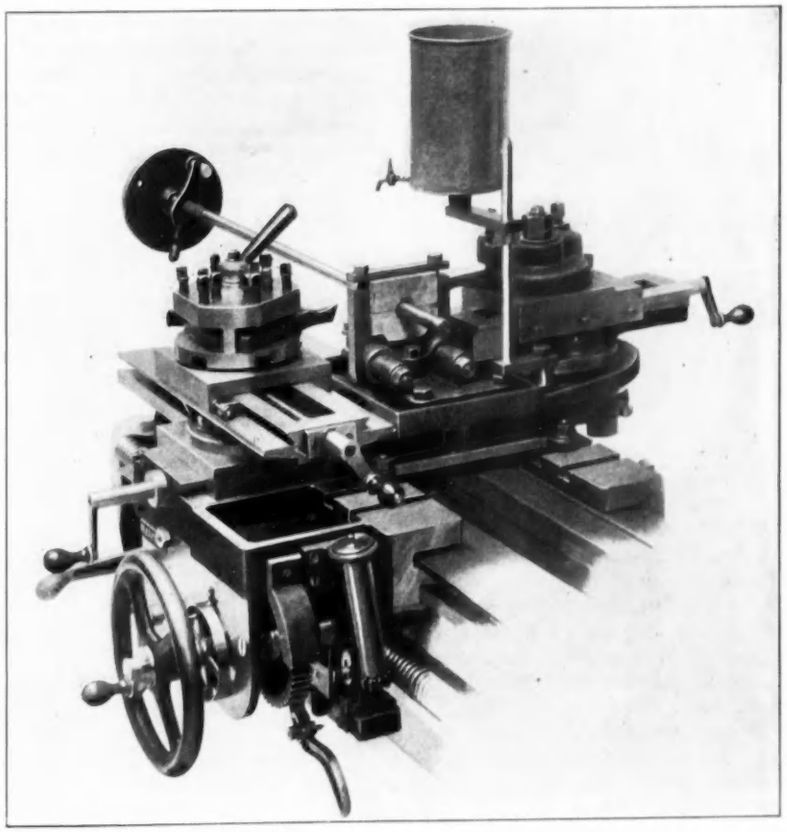


FIG. 30. VIEW OF CARRIAGE OF GERMAN LATHE.

and elsewhere, which are making highly satisfactory returns of business. Southern cotton gins in this country are among the classes of establishments from which there is a very brisk demand for wood pulleys. In New England, however, the textile mills are not foremost as wood pulley consumers. This is partly because their equipments are not of a character which occasions frequent changes in speeds after the machinery is installed. When once they have a pulley in, they expect to keep it for the next six generations. Also, the pulleys they require are generally small ones. Wood pulleys of less than 20 inches in size constitute the sugar and salt of the wood pulley trade, on which there is relatively small profit. It may be said that the margins of profit on wood pulleys are not excessive, anyway. Mr. Reeves is of opinion that the present prices will be well maintained.

Messrs. Gay & Ward, of Athol, Mass., who succeed to the milling cutter department of the L. S. Starrett Company, started the machinery in their new shops Monday, July 2. These shops are of interest as being, perhaps, the largest in the world devoted exclusively to the manufacture of milling cutters. The main building is of brick, 140x65 feet, three stories in hight, of heavy mill construction. There is also an annex 60x65 feet, bringing up the total floor space to 33,000 square feet. Care has been used to make the shops modern and complete in every respect.

Edw. N. Hurley, president of the Standard Pneumatic Tool Company, Chicago, sailed for Europe June 30, for the purpose of establishing works in Germany and France for the European trade. They now have large works in Chippenham, near London, England, but on account of the enormous demand for their product on the continent during the last year and the steady increase of the same, they have deemed it advisable to establish additional works in the countries mentioned in order to supply the demand. Mr. Hurley will also be in attendance at the Paris Exposition, where the company has two large exhibits of pneumatic tools and appliances in the Champ de Mars and Park Vincennes. He expects to return within the course of a couple of months.

The Philadelphia Forge Company, New York office 32 Cliff street, will erect a machine shop, about 30x60 feet, and is in the market for a 48-inch, a 36-inch and two 18-inch lathes, a radial drill, cutting-off machines, emery wheels, etc.

CINCINNATI REPORT.

There is really little to be said that is new concerning machinery and machine tool enterprises in the territory of which Cincinnati is the center. Even among the larger and older established concerns there is on a genuine summer dullness, and in its most pronounced form. Many of the smaller establishments are closing down; that is, for the period represented in the next eight or ten weeks. This does not in any sense represent the conditions with the larger machine tool concerns, for as a rule they are yet at work on heavy orders placed late in the spring. One large Cincinnati concern, as an evidence of how carefully matters were planned, has on hand about 400 tons of castings. This concern feels especially gratified in the face of the agitation now on among the foundry men. In this connection an uprising on the part of that feature of the local machinery trade seems imminent. John A. Penton, of Detroit, who was here recently in the interest of the National Founders' Association and took a prominent part in the discussion over an increase in wages, is registered at the Grand Hotel at this writing. There has been no manifestation since July 1, the date on which the demand was made, but everything points to early rupture. As was stated earlier in this letter, many of the machinery concerns are closing down, or at least run-

(*Continued on page 46.*)

Quotations.

NEW YORK, Monday, July 9, 1900.

Iron—American Pig, tidewater delivery:—

Pennsylvania Irons:	
No. 1 X foundry	$18 00 @ $19 00
No. 2 X foundry	17 00 @ 18 00
No. 2 plain	16 00 @ 17 00
Alabama Irons:	
No. 1 foundry	18 25 @ 20 25
No. 2 foundry	18 00 @ 19 25
No. 3 foundry	17 50 @ 18 25
No. 1 soft	18 25 @ 20 25
No. 2 soft	18 00 @ 19 25
Foundry forge	16 25 @ 18 25

The pig iron market is unsettled, some sellers making concessions, others holding for an advance.

Bar Iron—Base sizes—The price on dock is 1.50 @ 1.60c. for good refined brands, and 2 @ 2.10c. upward for same from store.

Tool Steel—Base sizes—Good standard quality 7 @ 8c.; extra grades, 10 @ 14c.; special grades, 16c. and upward.

Machinery Steel — Base sizes — From store, 2.20 @ 2.50c.

Cold Rolled Steel Shafting—Base sizes —From store, 3¼ @ 3½c.

Copper—Lake Superior Ingot, 16¼ @ 16⅜c.; electrolytic, 16⅛ @ 16¼c.; casting, 16 @ 16⅛c.

Pig Tin—Quotations heard to-day from 31 @ 31¼c. A fair figure would 31½c., f.o.b., for 5-ton lots.

Lead—For wholesale lots, 4c., with .02½ @ .05c. extra for carloads, New York.

Spelter — Prime Western, 4.27½ @ 4.30c., New York delivery.

Antimony—Cookson's, 10¾ @ 11c.; United States, 9⅜c.

Lard Oil—Prime City, 54c. in one to five-barrel lots.

The Paris Exposition—VII.

EDITORIAL CORRESPONDENCE.

One of the Baldwin locomotives exhibited at Vincennes figures as the innocent cause of a somewhat sensational incident in the French Chamber of Deputies. A member objected not alone to the fact that a French government railway had gone to America to purchase locomotives, but especially and particularly that the administration should have this American engine exhibited as it is, with the name of the road it is to run on prominently displayed, thus announcing to all the world that France has gone abroad to buy locomotives. Why, he wanted to know, do we go to America for locomotives, and thus injure a French industry which can hold its own with all the world? Whereupon M. Coutant is reported as replying: "You know very well that we cannot build such locomotives in France," and upon being tauntingly replied to, said that he was an engineer. Just why they could not build such a locomotive here if they chose to do so is something I do not understand. They certainly build very many that are at least equally difficult to construct, and in fact the Minister of Public Works, M. Pierre Baudiv, said the locomotive was ordered from America because the French builders were overloaded with orders, and was exhibited because it was considered proper for the State Railways to exhibit the latest rolling stock provided for the road, no matter where it came from.

SOME FRENCH LOCOMOTIVE WORK—SOME MILLING CUTS.

Speaking of locomotive work, the Compagnie des Chemins de fer de l'est exhibit in the department of civil engineering in the Champ de Mars some specimens of rod work and a link and block for a locomotive that no builder would need to be ashamed of. The link and block, particularly, are both hardened and beautifully finished by grinding on a special machine, a photograph of which is exhibited along with the work. They also show some things that give evidence that they appreciate milling and are prepared to do it efficiently. Two milling cutters are shown with their arbors. One of these cutters is solid, with spiral teeth of about 20 m/m (¾ inch) pitch and 250 m/m (9 13-16 inches) diameter by 400 m/m (15¾ inches) long. The other cutter is of about the same dimensions, but has inserted spiral teeth (strips of steel fitted to dovetailed grooves), and having a pitch of 36 m/m, or 1 7-16 inches. Between these two cutters is a box with glass sides, ends and top, which box contains the chips cut from mild steel with one of these cutters in ten minutes. The chips are all alike, the full length of the cutter, rolled up like straws, and their weight is given as 7 kilograms, or 15.4 pounds, which would be at the rate of 92.4 pounds per hour.

According to an appended statement of the conditions, the depth of cut was 15 m/m (9-16 inch), the feed 15 m/m (9-16 inch) per minute, speed of the circumference of the cutter 10 meters (32.8 feet) per minute.

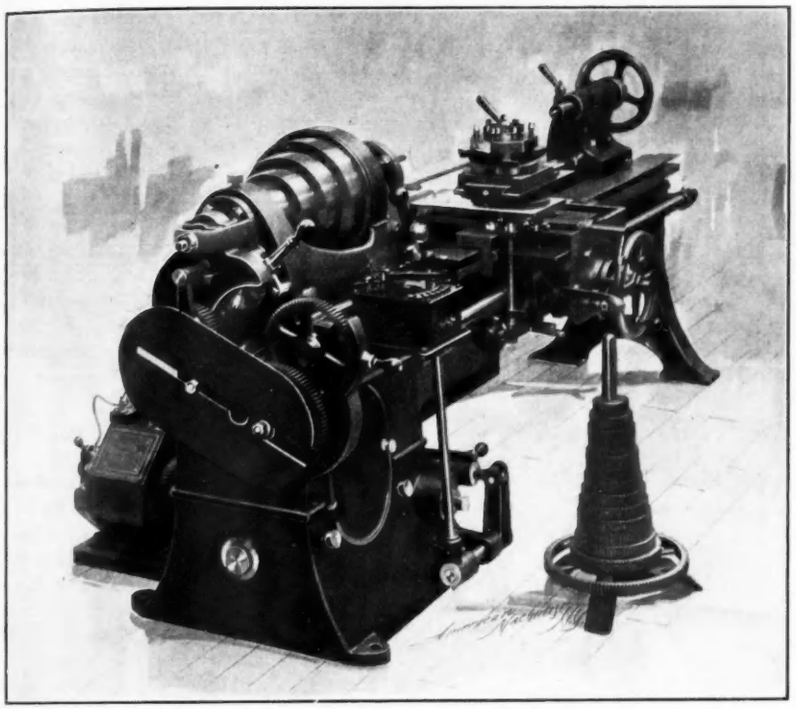


FIG. 29. ENGINE LATHE EXHIBITED BY THE WERKZEUGMASCHINENFABRIK "UNION," OF CHEMNITZ.

A GERMAN LATHE.

The Werkzeugmaschinenfabrik "Union," of Chemnitz, Germany, exhibit in the Champ de Mars only one tool, and that is a lathe, which they believe a demand can be worked up for in Europe, and which they have fitted up to manufacture in a systematic way. The general features of the lathe are well shown by Figs. 29 and 30, the last named being a view of the carriage, with extra rest supplied for turning such pieces as the one shown.

Like so many of the modern Continental machine tools, it is avowedly based upon British and American practice, with (in this case) additional ideas thought to be improvements for the market for which it is designed. It will be noticed that the flat top bed is adopted, but instead of leaving the sliding surfaces exposed, as usual, they are carried down below the top of the bed and are covered by strips of steel, which are fastened to the bed above them and project out to the edges. This, of course has the disadvantage that it increases the hight from slides to centers relatively to what the lathe will swing, and makes a cut through the carriage necessary where the strips pass through. But the advantages are considered to more than counterbalance this.

There is a turret tool-post, which is made triangular for three tools, so that when desired the cutting points of any two tools can be brought close together at the apex or one corner of the triangle, and there is a special indexing notch to hold them in cutting position when thus placed. The two tools then cut simultaneously, either with one roughing and the other finishing, or for turning two different sizes at one cut. The back gears are placed below the spindle (which, it will be noted, is not hollow), and there are the usual tumbler gears for reversing the motion of the screw train. Motion can be taken for the screw train from the back gear shaft for coarse pitch screw cutting, and when this is done the safety lock shown in position in Fig. 29 is put in place on the stud and prevents the tumbler gears from being thrown into engagement.

The lathe is especially designed so that it may be driven either by direct-connected motor or from a countershaft, as may be desired, without material alteration—in fact, none except in the base, or column. There is an automatic release for the cross feed in either direction, as well as for the carriage feed, and also an indicator for closing the nut at the proper time in screw cutting when the lathe is running.

Fig. 31 is a horizontal section through the column as supplied for motor driving. *A* is the motor, which regularly drives the cross shaft *B* with one reduction by spur gears as shown. By means of the friction clutch *C* the cone pulley is driven from shaft *B* in one direction, while by two positive clutches *D* and *E* it is driven at two different speeds in the other direction; these two last named clutches being not directly upon the shaft *B*, but upon

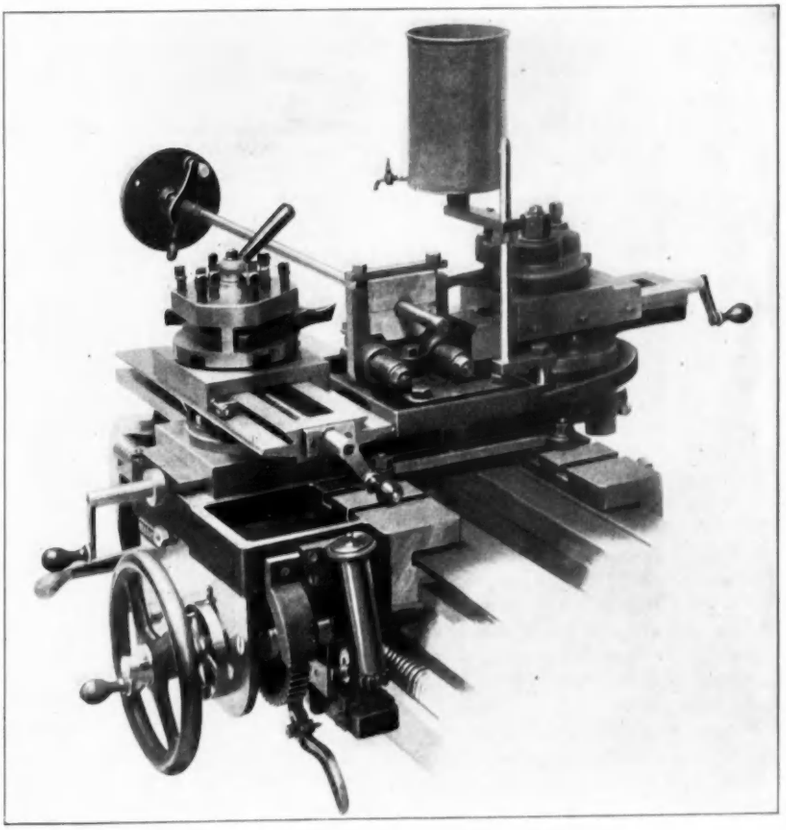


FIG. 30. VIEW OF CARRIAGE OF GERMAN LATHE.

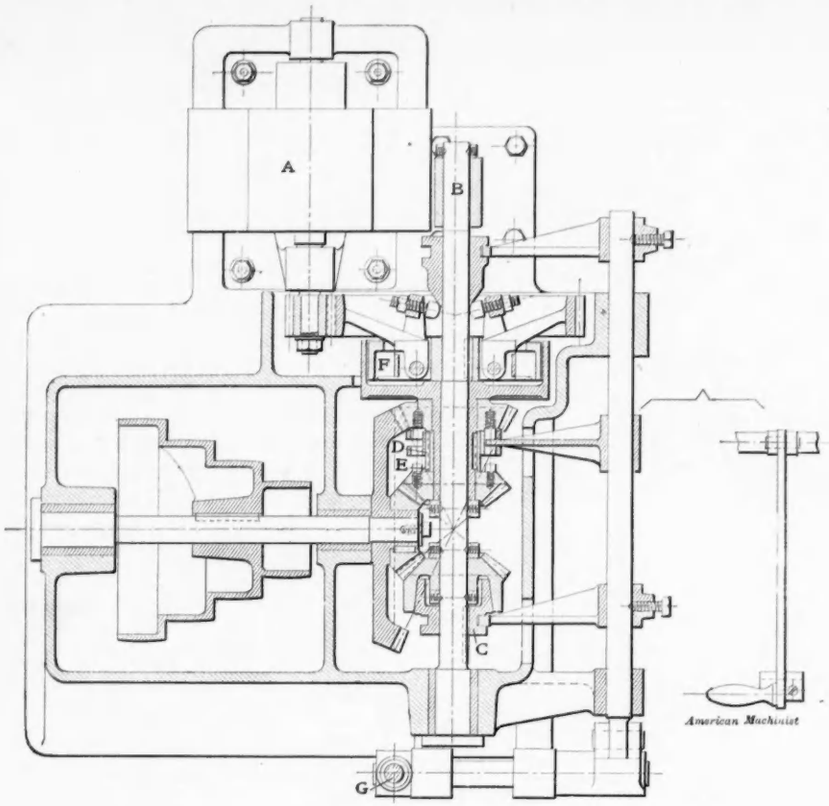


Fig. 31

HORIZONTAL SECTION OF COLUMN DRIVING MECHANISM OF LATHE.

a sleeve driven by the friction clutch *F*. The two friction clutches are controlled by the vertical lever *G*, Fig. 31, and which is seen also in Fig. 29. The cone pulley shown in Fig. 31 is, of course, within the column, and drives the spindle cone by means of a short belt. The positive clutches *D* and *E* are engaged by the rod with handle shown at the right of Fig. 31, this being operated only when it is desired to change the ratio of the driving. There is also a clutch on the lathe spindle for throwing the back gears in and out of action, this being shown in Fig. 32, where it is seen that the two pins pass through the large spindle gear into the pulley, while at the same time the pinion below is drawn to the right out of engagement.

This view shows also that both bearings are taper, and that a single threaded collar takes up both of them.

At Fig. 33 the arrangement for successive automatic stops of the carriage feeds is shown. There is a slotted bar on the front of the bed, to which are fastened the various stops, such as 1 to 5, that may be needed for any piece that is to be turned in numbers, and the stepped disk *H* is, after each stop, turned so that it will pass the stop with which it has just contacted and will then contact with the next stop, and this disk is at the end of a shaft, which, by being moved to the right, stops the feed. The stops can be set either by a scale or there may be a gage for the purpose, representing the proper location of the various shoulders.

Fig. 34 is a section of bed and footstock, showing that they use the excellent Sellers device, by means of which a footstock so fitted to a flat bed may be free to slide—even loose—and yet always be brought into correct alignment when clamped. The surface at the left inside edge of the bed is made straight and true, and under it is the beveled surface seen. When the clamp is drawn up it is, of course, drawn to the left by this beveled surface, and is prevented from moving in that direction by the square shoulder on the footstock, which it engages and thus forces the footstock over snugly against the side surface intended to align it.

This lathe, as the engineer who designed it explained to me, is intended not only for general work, but especially for that which is to be made in duplicate up to considerable numbers, and, in fact, to answer the purpose of a turret machine where, for any reason, the turret is not available or applicable.

A NEW BORING AND TURNING MILL BY WARNER & SWASEY.

A new American tool that is shown at the Champ de Mars, and one which represents also a new departure for its builders, is illustrated by Fig. 35. It is a boring and turning mill by Warner & Swasey, of Cleveland. This machine embodies some new ideas for this class of tool, prominent among which is the arrangement of the driving mechanism for the table, so that it is all made and assembled separately, and then bolted to the side of the base, the drive being by means of a spur pinion which takes hold of the gear at the point which brings the cuts on the radial line joining the driving pinion and the center spindle of the table, and thus very materially reduces the lateral thrust upon spindle and boxes. The gearing, as will be

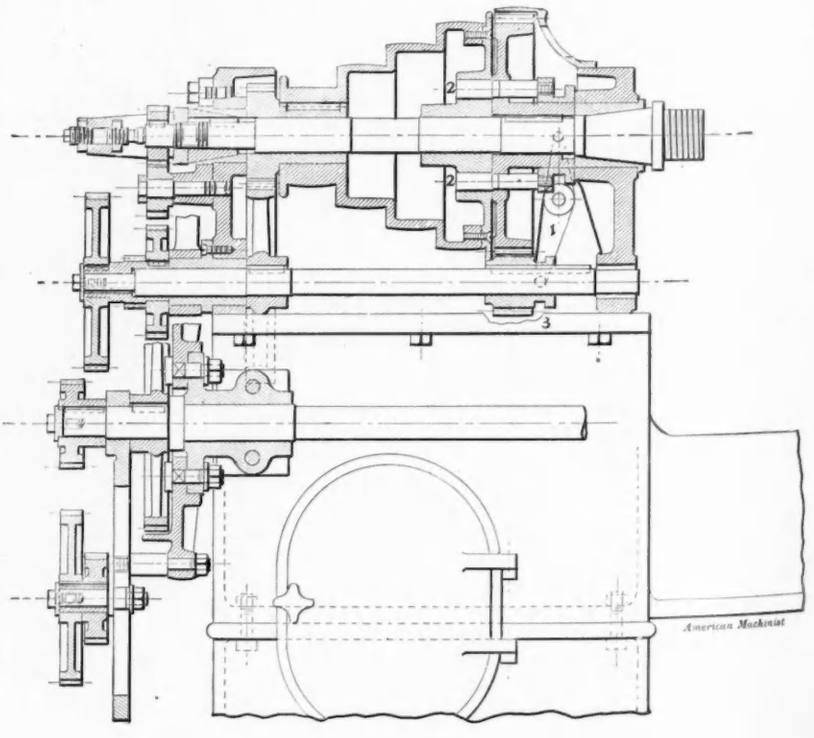


Fig. 32

SECTION OF HEADSTOCK AND GEARING.

observed, is entirely covered, and there is, on the horizontal driving shaft, a friction clutch by which the speed ratio is changed by the movement of a lever without stopping. This, with two speeds on the countershaft and the three-stepped cone pulley, gives twelve rates of motion for the table. From the horizontal shaft the feed motion is taken to the shaft above, and from thence by the small cone belt to the cross rail, there being here also a clutch, which by the movement of a lever alters the ratio of the feed motion, while the small crank lever at the top of the feed motion case reverses the feed motion. There are eight rates of feed.

The spindle is supported in two cylindrical bearings that have split taper sleeves adjusted by threaded collars, accessible when the front plate is removed from the base, and at the top the weight is taken by a very broad flat bearing, which has a rim around it, making it an oil reservoir. The chuck jaws can be clamped by T-bolts to any position on sliding inverted-T-shaped pieces that can be moved radially, either singly or together.

The feed is engaged by a drop worm shaft at the end of the cross rail; the motion is transferred from the saddle feed to the vertical and angular feed by moving a small lever carrying the intermediate pinion, and both the horizontal and vertical feeds are automatically thrown out at any desired point when moving in either direction. The counterbalance weight is suspended within the column. There are graduations on the vertical slide to indicate depths to which the tool is set, and the lever at the right of the vertical slide withdraws the locking pin of the turret. In general design and appearance the photograph speaks for itself.

A PRATT & WHITNEY MILLER.

I believe that to the Pratt & Whitney Company belongs the distinction of having here the most complete installation of tools to be found by any one maker. Their exhibit ranges all the way from the smallest taps and dies, standard gages, etc., up to bench measuring machines, standard machine tools, such as lathes, planers, shapers and milling machines, and to a line of more special tools as well, such as automatic screw machines, gun-barrel driller, rifling machine, etc.

Their largest and heaviest machine exhibited is shown at Fig. 36. It is exhibited here at work for the benefit of those who may be interested in it, the cut being that which is taken on top and sides of their new style lathe bed. A gang of cutters with inserted teeth is used, and a special casting representing the lathe bed has been provided for exhibition purposes, the result being that the machine attracts a great deal of attention. Both the uprights are movable toward or from the platen, the least distance between spindles being 14 inches, and the greatest 54 inches. The manner of attaching these uprights to the bed seems to me to be thoroughly good and worthy of special attention. It is shown in Fig. 37, which is a sketch not in all respects made to scale, but with the principal dimensions as shown. The direction of rotation of the spindles is such that the tendency is to tip these uprights over to the left, and it will readily be seen that this tendency is admirably resisted. There is a scraped bearing over all the vertical, horizontal and angular surfaces marked *s*, but the surface at the left-hand edge of the bed is cleared, leaving the ones at the front to do the guiding, and the gib *g* is locked in a seat provided for it, so that by drawing it up solidly by the screws provided for that purpose it is practically as solid as though it were integral with the upright. This upright does not, of course, move upon the bed while a cut is on; but there are many slides of machine tools exhibited here which do move while subjected to the stress of a cut, and which are not nearly so well designed nor fitted for effectual resistance to deflection and detrimental wear.

The gang of cutters referred to is driven by one spindle and supported by a bushing placed in the end of the other one, which has nothing else to do for that cut, but both spindles may be driven for face milling on the sides of work, and in one case, where one of these machines was fitted up for milling corrugations in steel plates 3/8 inch deep and 1 inch pitch, with a cut 34 inches wide, both spindles were arranged to drive on the same arbor. The saddles are moved vertically together by power, and each may also be moved by hand by the crank handles shown, which rotate the nuts. The belt is 5¼ inches wide, runs on a cone pulley, the largest step of which is 28 inches; the ratio of gearing is 19½ to 1, and the spindles are large enough to back up this driving

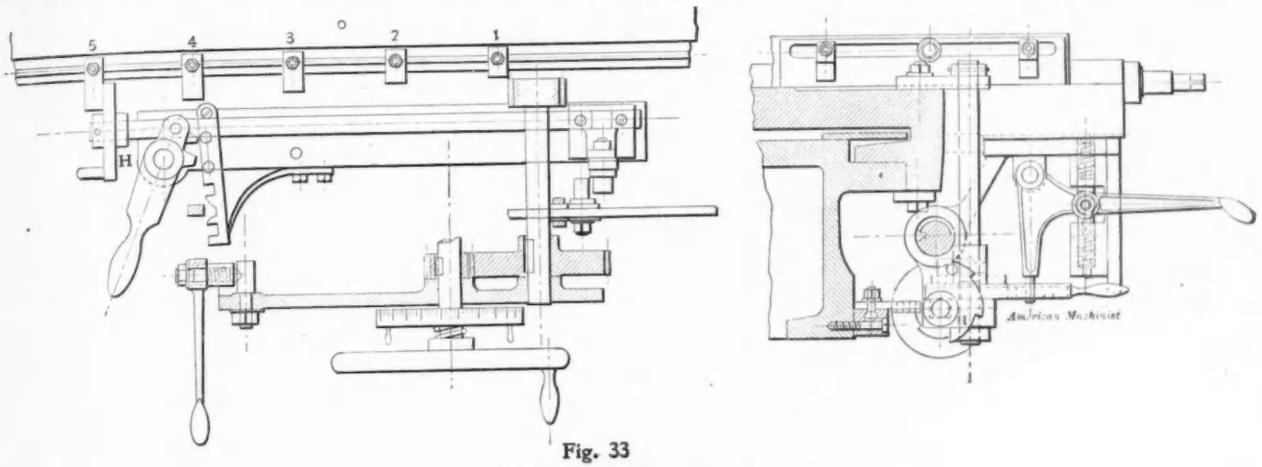


Fig. 33

DETAILS OF GERMAN LATHE.

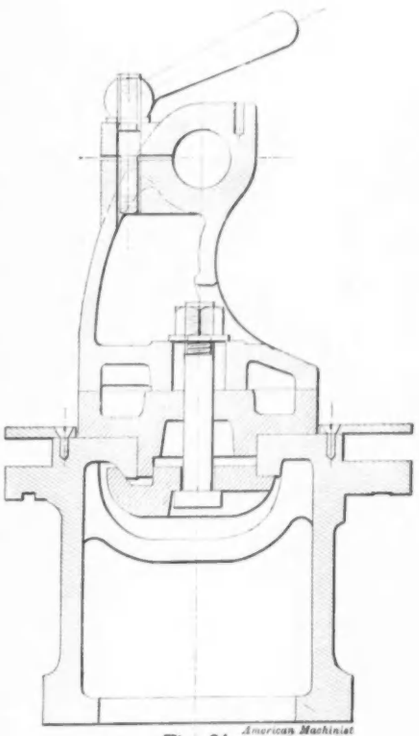


Fig. 34

CROSS SECTION OF BED AND FOOTSTOCK.

power, the front bearings being 5½x11 inches.

A SHAPER.

Another tool shown by the Pratt & Whitney Company that is not apt to attract so much attention perhaps, because it belongs to what are classified as the standard tools, is the shaper shown by Figs. 38 and 39. It is a 12-inch shaper, regarding which Mr. Francis C. Pratt tells me a rather interesting story. Their older shaper (with which I personally had some shop experience) had the usual slotted lever in-

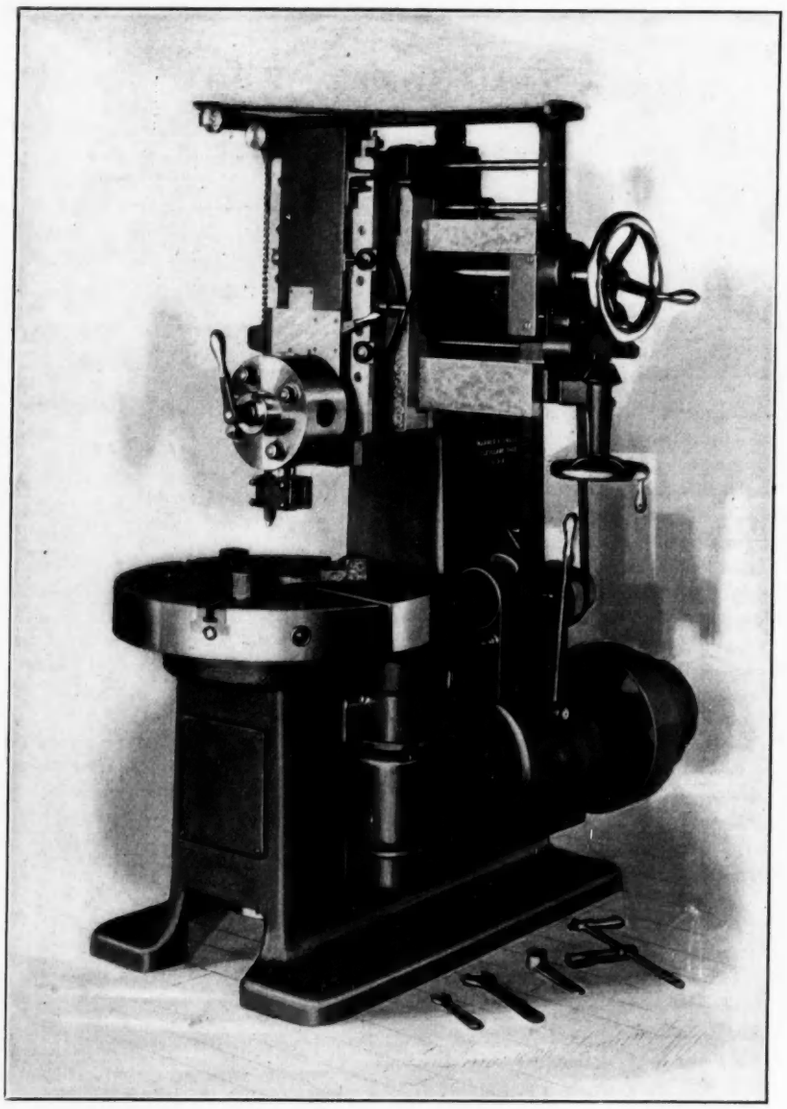


FIG. 35. BORING AND TURNING MILL EXHIBITED BY WARNER & SWASEY.

side the column for the quick-return stroke, and the crank pin had to be set (to a scale made on the lever) by opening the door in the side of the column and loosening a nut with a socket key wrench. They finally designed a shaper in which this adjustment was made from the outside by means of the now common arrangement of a sliding nut carrying the crank pin to or from the center of the gear, moved by a screw and miter gears with a squared shaft projecting for a crank handle. Some of these shapers were tried in their own shops and they did not give entire satisfaction. No matter how closely they might be fitted in the first place, more or less lost motion soon developed in the gears, the screw and the sliding crank-pin block, and there seemed to be no way to overcome this, nor to make the parts of sufficient dimensions to avoid it, the result being that the shaper did not conform to the Pratt & Whitney standard of what a machine tool ought to be. Francis C. Pratt was at that time working in the drafting room, and was given the job of going over that shaper. He worked at it for some time without results that were satisfactory to him, and finally at home spoke of the matter to his father, who, within five minutes, sketched the arrangement shown in Fig. 39, which has since been regularly used with entire satisfaction and has been adopted by Mr. Johnston for the Potter & Johnston shaper, he having been in charge of the Pratt & Whitney drafting room at that time, and believing that it is the best arrangement at present known. The general arrangement, but not the precise details nor the proportions, are shown by Fig. 39, which is from a sketch made for me by Francis C. Pratt, in which sketch *a* represents a section of the column or frame of the machine, *b* the large gear which is driven by a pinion on the inner end of the cone shaft, and which is journaled in the sleeve shown, that is secured to the frame by screws passing through the flange; *c* is a disk with a beveled edge, which fits into a recess in the face of the main gear, and carrying on its outer face the crank pin *d*, which, by the rotation of the disk *c* within the gear, is carried toward or from the center to give any desired stroke. The rotation of *c* is accomplished by means of an ordinary open wrench applied to what looks like a box nut *e*, which is not really a nut, but a hexagonal piece keyed to the stem of the beveled crank pin disk and having a flange with graduations to indicate the stroke. The outer box piece is a real nut, and when tightened draws the beveled disk firmly to its seat and holds it. This arrangement is found to be solid and firm, and to remain so in use. The builders do not believe that it is desirable or needful to change the stroke of a shaper while running, especially when it is provided with a vise having a slide beneath it which is parallel with the ram motion and which permits the work to be moved forward or back while cutting, as circumstances demand; and such a vise is always supplied with the machine.

Another point in which this shaper departs from the usual practice is in having one beveled and one square edge on the face of the column in front for holding the cross rail to the column. At the left is the beveled edge, and the rail is entirely without gibs or means of adjustment on that side. On the other side, where the square edge is placed, the usual gibs are provided, and thus only one side needs to be looked after in taking up the gibs, the beveled side taking care of itself when the other is properly adjusted.

Other machines and tools exhibited by the Pratt & Whitney Company will be taken up later. They are showing what is, so far as known, the first set of hardened and grooved plug and receiver gages of the newly adopted international system of screw threads. These plugs are ground in the threads after hardening by the use of steel grinding wheels charged with diamond dust and traversed by the most accurate procurable lead screws, so that the threads are ground accurately, not only for diameter, but for pitch as well. I asked what the limit of error would be that would be guaranteed upon these gages, and was informed that no limit would be placed upon them. They are simply declared to be exact, and anyone who is qualified and is interested may determine for himself how much of error

there may be in them, if any. There are twenty-two pairs of these gages, ranging from 6 m/m to 52 m/m diameter, and they are worth something over $450.

A TOOL STEEL EXHIBIT.

The Crescent Steel Company, of Pittsburgh, have an exhibit in the Department of Mines and Minerals on the Champ de Mars that is interesting to shop men as showing what may be done with steel. The exhibit consists mainly of specimens of tools that have been made of Crescent steel by various users of it, and which tools have rendered remarkable service. There is, for instance, a drop hammer die that was made by one of the clock companies for stamping an ornamental clock dial of sheet brass. The figures on the dial are raised, and there is a great deal of intricate embossing in the design. The clock company's statement is that this die has made 1,344,000 dials, each of which was struck two blows, so that it has stood 2,688,000 blows, and it seems in as good condition as at the beginning, and dials recently struck up by it show a sharpness of definition that is entirely satisfactory. A ⅞-inch punch is shown that was made and used by the Union Iron Works, of San Francisco, and did service in the construction of the now famous "Oregon." This punch, after punching 27,000 holes through 1⅛-inch steel, was bent and used up by an accident in punching angle iron, and looks as though it would be good for another 27,000 holes had the accident not happened. Some heavy chips are shown that were cut from a cast-steel locomotive frame in the Pittsburgh Locomotive Works. These chips are colored by the heat generated in cutting them, the color ranging from a deep straw to purple and down to deep blue. The cutting was done by a recently perfected self-hardening steel made by the Crescent people, and the chips would seem to show that the practical limit of cutting speed had been reached, although the speed is not given, and I do not know what it was. We all know, however, that when steel chips are blue the utmost limit of heat that can be borne is about reached, no matter what the speed may have been. Another chip is shown which is coiled up like a clock spring, and was evidently cut by a parting or cut-off tool. It is 3-16 inch wide, 19 feet 2 inches long, and shows not only good cutting conditions and a good tool, but the homogeneity and uniformity of annealing of the steel bar. Both bar and tool were of "Crescent Extra." Dies for drawing brass and copper are shown, and one of these is for 24-inch tubes, and has an outside diameter of 26½ inches. One of the things to be learned from the exhibit is the great advantage of good steel (and for some tools the best possible steel) as compared with inferior grades. Dies are shown, for instance, for which the steel may have cost $5 as against half that amount for a cheaper grade, either of "Crescent," or any other brand. But the work on these dies must have cost more than $100, and if the better steel will perform twice the service, which it will usually do (and sometimes much more), the gain is about $47.50 saved, aside from loss of time and annoyance always caused by failure of tools.

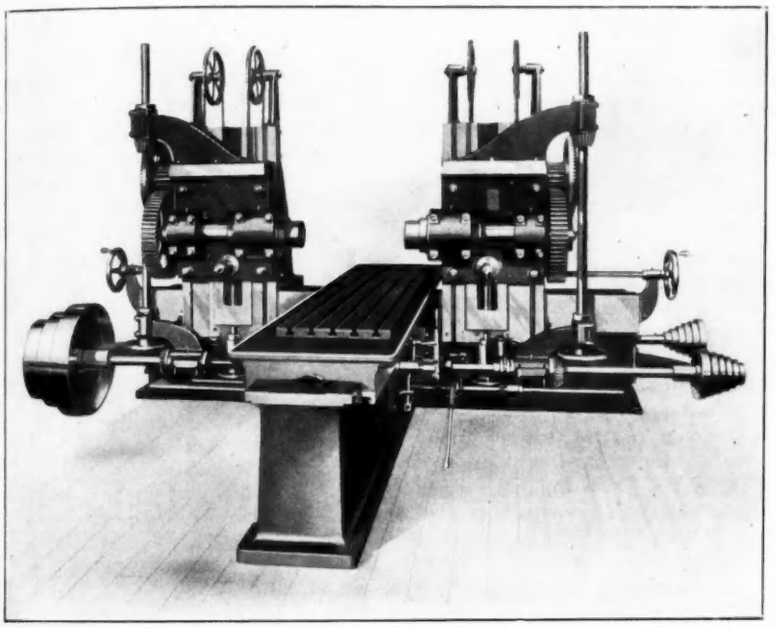


FIG. 36. DOUBLE-SPINDLE MILLER EXHIBITED BY THE PRATT & WHITNEY COMPANY.

THE EXHIBITION PRACTICALLY COMPLETE.

Although there is here and there a still uncompleted exhibit in the exposition, it may now be said that it is, as a whole, practically completed, and those who are visiting it now are not missing very much that will be seen later by others. The general verdict is, I think, that it is far better worth seeing than any exhibition that has preceded it. America is certainly well represented, having the largest number of exhibitors next to France herself, and the entire Continent of Europe, as well as Asia and India, have contributed of their best to the general result, commercial conditions being, of course, much more favorable here for the exhibition of European goods than they were at Chicago in '93, the result being very plainly perceptible when one walks through the sections devoted to various kinds of manufactured goods, especially of the finer kinds that may be classed as artistic.

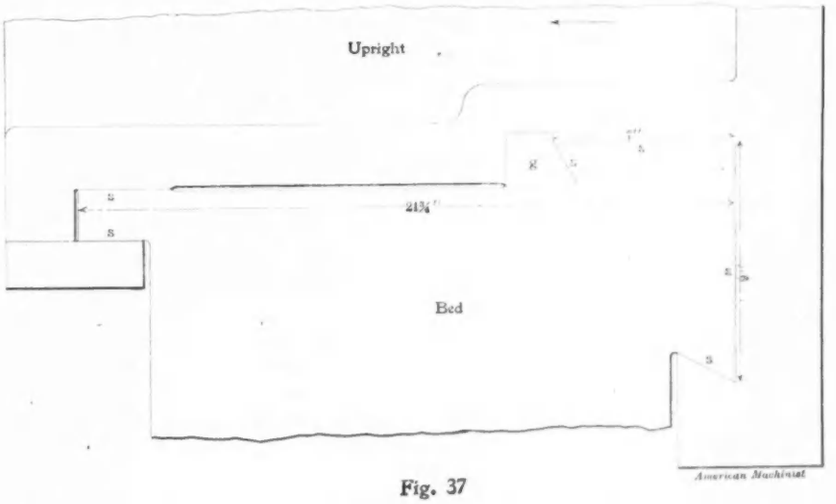


Fig. 37

SKETCH SHOWING METHOD OF ATTACHING UPRIGHTS TO BED OF PRATT & WHITNEY MILLER.

Since I wrote last week it has been discovered that water in the low-pressure cylinders of the Willans & Robinson engine at Vincennes is responsible for the breakdown that took place, and that both low-pressure pistons were broken. The engineer removed them and ran the engine with two high-pressure cylinders only until new pistons arrived. F. J. M.

Paris, June 15.

The Determination of Time Limits Under the Premium Plan.

BY GEO. H. HALL.

With the adoption of the premium plan of paying for work must come a systematic method of setting time limits and a classification of data in such shape as to be easily available for the establishment of new limits with the least amount of work. Time limit setting is not, as many seem to think, a mere question of guess-work, but is, on the contrary, a matter of mathematical deduction from known facts and the application of these deductions to new cases. In order to intelligently adopt bases for figuring time limits, it is necessary, first, to investigate previous returns of similar work to that upon which the limit is to be fixed. These bases are to be determined not only by an actual knowledge of what has been done, but by the judgment of the foreman or superintendent setting the limit in regard to what he thinks ought to be done.

For most classes of shop work it is impossible to lay down any rules which can

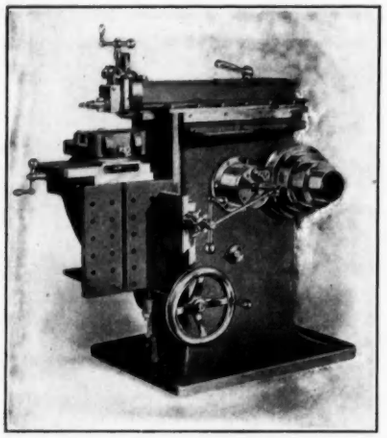


FIG. 38. LATEST PRATT & WHITNEY SHAPER.

be applied in all shops, as the same work in different shops is performed in many different ways and on many different machines. It is, therefore, not the purpose of this article to give any data or limits for general use, but simply to show how limits are determined in one shop and the means by which the data for their establishment are determined.

For flat surfaces such as are planed or milled, the unit of work is the square inch of area, but in figuring on work performed on cylindrical bodies, circular areas or spheres, much time and many extra figures will be saved by considering the diameter inch instead of the square inch. The diameter inch is 1 inch $\times$ π, or in other words, we use the equations for the surface in square inches with the omission of the quantity π, thus:

Form of Surface.	Area in Sq. Inches.	Area in Diam. Inches.
Cylinder,	$l \pi d$	$l d$
Circle,	πr^2	r^2
Sphere,	πd^2	d^2

l = length, r = radius, d = diameter. Final results can, if desired, be converted into square inches by multiplying by 3.1416.

Considering now the derivation of a basis from previous results, we will suppose we wish to obtain a basis for chucking and boring on the horizontal chucking machine. We will first collect all available data relating to doing similar work of somewhat approximately the same size on the same or similar machines to those on which the premium work is to be done. We find one case in which 150 pieces having a hole 1 inch in diameter, 5 inches long, were chucked and bored in 19½ hours; another return shows that ten pieces having a hole 2 inches in diamteer and 6 inches long were chucked in 27 hours. The diameter inches machined were 5 $\times$ 1, or 5 each, and 2 $\times$ 6, or 12 each, respectively, the total diameter inches being 750 and 120.

The time consumed on the work consisted of the time spent in handling each piece and that spent in actually removing the metal. In the case under consideration we will suppose the pieces were of about the same size, so that we can consider the amount of handling the same on all of the pieces. Now the time employed in handling will be proportional to the number of pieces, while the time actually spent in removing the metal is proportional to the number of diameter inches machined.

Putting the above data into algebraic form, let x equal the time spent in boring one diameter inch and y the time consumed in handling each piece. In case we consider that the handling of the pieces of one lot is greater than the handling of those of the other lot, we can represent it by using multiples of y proportioned in accordance with our judgment of the comparative amount of time required for handling the pieces. We have, for the case supposed above:

$$750\,x + 150\,y = 19.5 \text{ hours}$$
$$120\,x + 10\,y = 2.7 \text{ hours}$$

From which x = .02 hour, y = .03 hour. This represents the actual time spent in handling each piece and the time for boring 1 diameter inch. But these results are for two jobs only. If we take other cases and equate as before we may get values somewhat different from the first. To provide accurate data we must take the average of as many results as we can obtain.

Assuming that the above constitute an average of a large number of results, it is necessary, in order to use them as a time limit basis, to make some allowance for a premium, and this must be done by our judgment, based on our knowledge of how the work has been previously performed. In this case .01 hour was added to both x and y, thus giving the formula for chucking cored holes on the horizontal machine: .03 hour per diameter inch + .04 hour per piece. This is graphically represented by the upper diagonal line in Fig. 1.

For this part of the process no rules can be given, yet it is largely on just this particular point that the success or failure of the entire system depends. The foreman must know from observation whether the work has been done in reasonably good time, or if it has been "soldiered." If he is convinced that but little better can be than has been done in the past, he should make an inducement in the limit in order to bring out that little, to make the man "hustle" a little more, and study his speeds and feeds more closely. On the other hand, if he is convinced that there has been much time killing, the limit should be placed below actual returns. Often it is found that the best actual result obtained by day work is about the right thing for a limit, as a man doing a job in 8 hours on day work will often do the very same thing in 5 or 6 hours on premium work.

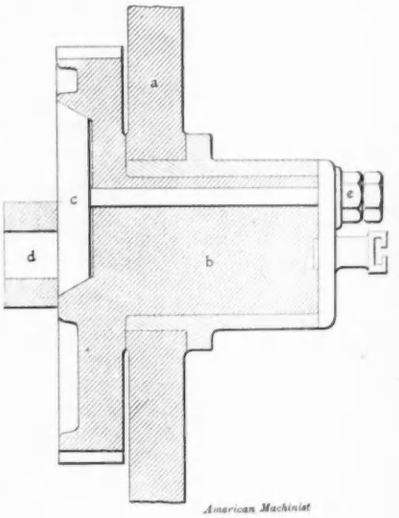


Fig. 39

SKETCH SHOWING ARRANGEMENT FOR CHANGING STROKE OF PRATT & WHITNEY SHAPER.

Even the relation which the limit time should bear to the estimated actual time cannot be definitely stated, as different shops have different premium rates. Thus, in a shop where the premium rate is high, the limits must be set much closer to the actual times than where the rate is smaller.

From this it will be seen that the proper establishment of the basis is of the greatest importance, as a basis for a certain class of work once fixed, time limit setting for that class of work is simply a matter of algebraic application. These bases, and also the limits which have been set from them, will naturally be so arranged as to be easily referred to, and anyone having such work in his charge will have his own ways of doing this, but the following diagrams and table may serve as suggestions which will be of assistance in arranging this work.

Fig. 1 is a limit sheet of the bases which

have been established for chucking cast iron on horizontal and vertical chucking machines. As an example, we will take pieces having cored holes which are to be bored 2 inches in diameter and 8 inches long on the vertical chucking machine. The diameter inches of machined work would be 16, and following the horizontal line of 16 diameter inches to its intersection with the "cored holes on vertical machine" line, then vertically down to the "hours" line, we find .7 hour as a suitable limit to give per piece for this work. If we had figured this by our equation, our figures would have been $(16 \times .04) + .06 = .7$. This time limit is for one machine.

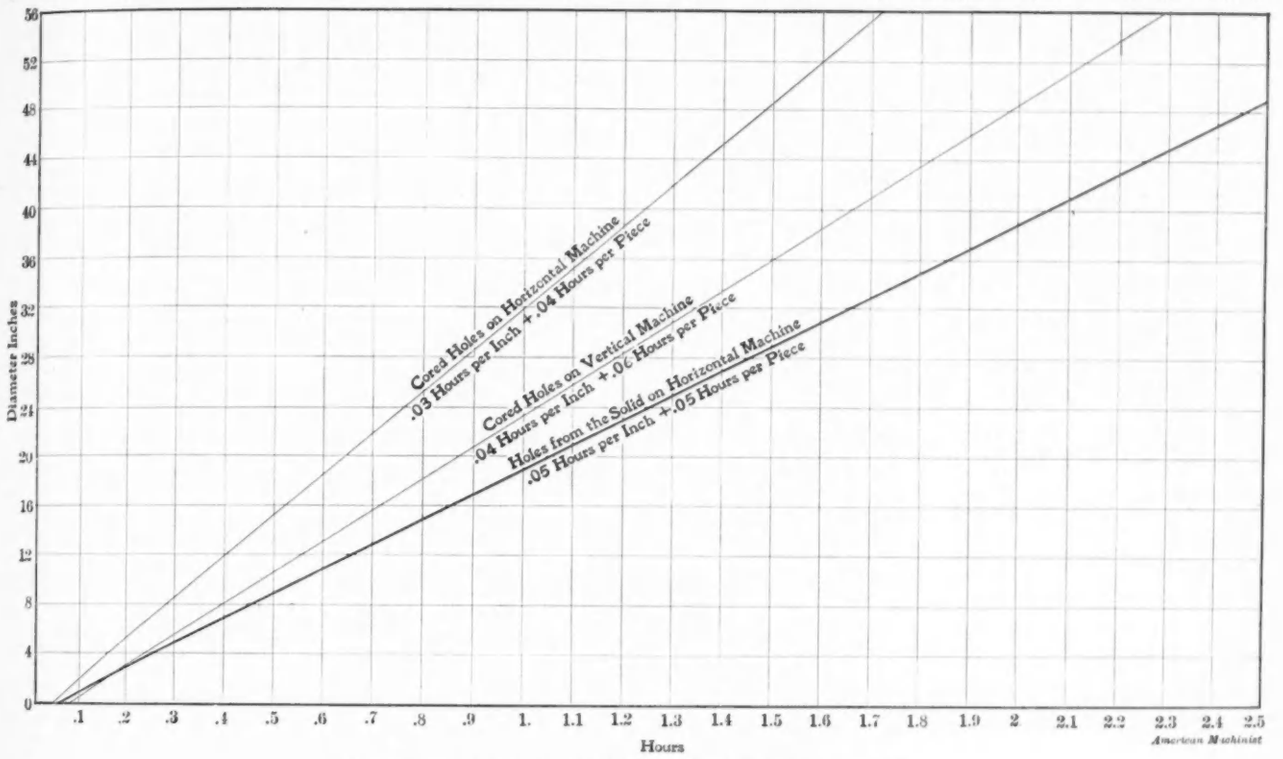
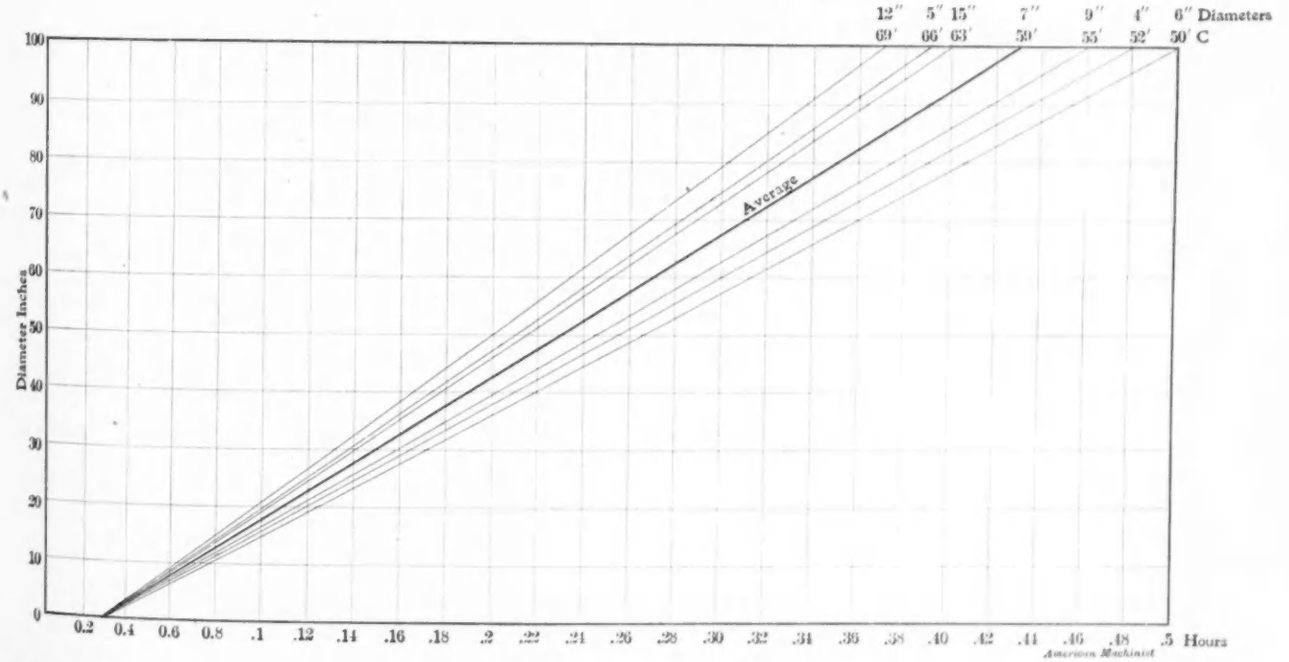

Cored Holes on Horizontal Machine
.03 Hours per Inch + .04 Hours per Piece
Cored Holes on Vertical Machine
.04 Hours per Inch + .06 Hours per Piece
Holes from the Solid on Horizontal Machine
.05 Hours per Inch + .05 Hours per Piece
Diameter Inches
Hours
American Machinist

FIG. 1. TIME LIMITS FOR CHUCKING AND BORING CAST IRON.



Basis—.004 hour per diameter inch $\times \frac{59}{C}$ + .03 per piece. C = cutting speed in feet per minute. Average cutting speed = 59.

FIG. 2. TIME LIMITS FOR TURNING PULLEYS.

Fig. 2 is a sheet of limits for turning pulleys on two lathes which are fitted with crowning attachments and pintles especially for this work. In this case the diameters of pulleys shown in the "diameters" line were the standard sizes which were to be done on these machines, so after establishing a basis on the average cutting speed of 59 feet per minute, we make allowance for the excess or deficiency in the speed at which a pulley of the diameter considered can be turned.

Let us consider a pulley 6 inches in diameter and 5 inches face, which would contain 30 diameter inches. In figuring a limit for this pulley we would have to

make allowance for the fact that these particular lathes are so speeded that in turning a 6-inch pulley no higher speed than 50 feet per minute can be used, as the next higher speed attainable with a 6-inch pulley in the lathe is over 69 feet, which is the maximum practical for this work. Our limit formula as given on the diagram then becomes (30 × .004 × $\frac{50}{50}$) + .03 = time limit = .17 hour each. The same result will be found from the diagram by following the line of 30 diameter inches to its intersection with the "6-inch diameter" line, and then vertically down to the "hours "line.

The table is a sample record sheet. There are manufactured six sizes of these particular spindles, and the limits, having been set, are tabulated, together with the bases and the data for areas machined, so as to be convenient for reference in setting limits for similar work.

The 5 hours under Turn and 4 hours under Thread for "setting up" are added to the product of the number of pieces times the time per piece, as an allowance for getting out and putting away any special tools or jigs required for the job, and for setting up the machine and cleaning it when work is completed. This allowance is the same regardless of the number of pieces in the lot. Thus, the limit for turning ten No. 5 spindles would be (10 × 2.75) + 5 = 32.5 hours, while for 100 it would be (100 × 2.75) + 5 = 280 hours.

The bases given in this table are for work on a Jones & Lamson screw machine, the size limit on diameters being .003 inch.

These data may be found quite reasonable for other screw machine work, although they are a little high, as the steel in these spindles is of an extra hard brand and the threads are the Acme standard.

As the bases for time limit work are designed to be of such liberality as to allow the workman to make a premium over his daily pay, it has been found that the same data are of great convenience in estimating the cost of new work, as the premium leeway over actual estimated time is just about right to make up for the allowance which is ordinarily added for the unknown factors of an estimation.

Numbers.....	1	2	3	4	5	6
Turn diameter inches.....	9.46	19.64	34.7	52.17	75	99.25
Thread diameter inches.	1.75	3.75	6.5	10.62	15	19.25
Turn.....						
5 hours for setting up.....						
Hours each...	.78	1.10	1.54	2.00	2.75	3.50
Thread.....						
4 hours for setting up.....						
Hours each...	.25	.30	.35	.45	.60	.75

BASIS FOR TURNING.

.03 hour per diameter inch + .5 hour piece.

BASIS FOR THREADING.

.02 hour per diameter inch + .22 hour per piece, 1 inch diameter and under.

.03 hour per diameter inch + .15 hour per piece, over 1 inch diameter.

TIME LIMITS FOR STEEL SPINDLES.

Crane Hooks—Errata.

Some unfortunate errors occurred in the table of formulas which accompanied Mr. Blake's article which was published under this title in our issue No. 24. As accuracy in these matters is of fundamental importance, we republish the table herewith, the errors having been corrected.

A Premium Arrangement for Foundry Apprentices.

Our attention was recently attracted by the policy adopted by the Farrel Foundry and Machine Company, of Ansonia, Conn., to insure the best service from their employees. The superintendent, to whom we are indebted for the facts in the case, tells us that the experiment was first tried upon the apprentices in the foundry, and was found to work so well that it was recently decided to apply the same rule to the journeymen. But the case is best stated in his own words. He says:

"I have been trying an experiment for the last two or three months in our foundry, which has proved very successful, and I thought possibly you might wish to recommend it in other localities for the welfare of the molder, and incidentally for the profit of the employer.

"Some time ago I tried the experiment of offering a special inducement to our apprentice boys for turning out good work, and I agreed that each apprentice boy who worked each day during the month, and during that time did not make any bad castings, should receive at the end of the month three days' extra pay—these three days to count against the time to be served by the boy. In case the boy lost one casting during the month, we made him two days' allowance instead of three, and if he lost two castings, we made him one day's allowance instead of three.

"The first three months eight boys out of eleven did not lose a casting. We figured up the average loss from the work of the boys during previous months and found that we made a fair profit on this arrangement, and the boys were very much pleased with the plan. We are still using this plan, and we find that the boys take a great deal more interest in their work than they did before.

"We found this plan so successful with the boys that two months ago we made a similar arrangement with the molders, agreeing to give every molder who was not absent during the month, and who did not lose a casting, one day off with pay, or, if he preferred to work, one day's extra pay at the end of the month.

"We found this plan to work to our ad-

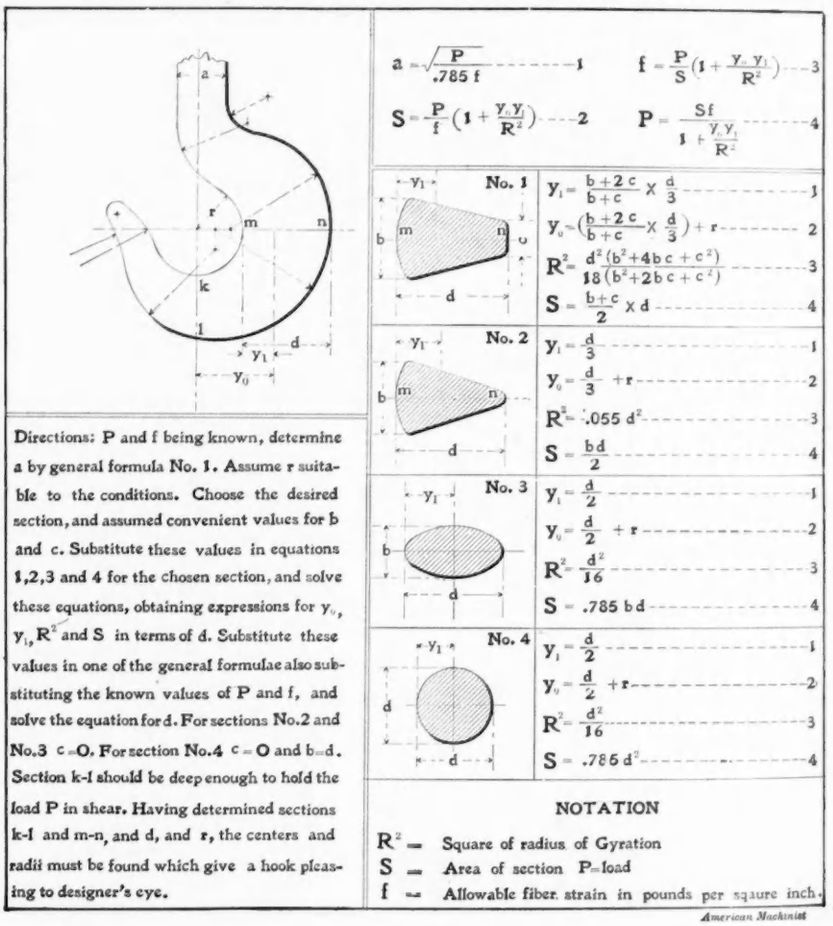

a = √(P / .785 f) ---1
f = P/S (1 + y₀y₁/R²) ---3
S = P/f (1 + y₀y₁/R²) ---2
P = Sf / (1 + y₀y₁/R²) ---4
No. 1
y₁ = (b+2c)/(b+c) × d/3 ---1
y₀ = ((b+2c)/(b+c) × d/3) + r ---2
R² = d²(b²+4bc+c²) / 18(b²+2bc+c²) ---3
S = (b+c)/2 × d ---4
No. 2
y₁ = d/3 ---1
y₀ = d/3 + r ---2
R² = .055 d² ---3
S = bd/2 ---4
No. 3
y₁ = d/2 ---1
y₀ = d/2 + r ---2
R² = d²/16 ---3
S = .785 bd ---4
No. 4
y₁ = d/2 ---1
y₀ = d/2 + r ---2
R² = d²/16 ---3
S = .785 d² ---4
Directions: P and f being known, determine a by general formula No. 1. Assume r suitable to the conditions. Choose the desired section, and assumed convenient values for b and c. Substitute these values in equations 1,2,3 and 4 for the chosen section, and solve these equations, obtaining expressions for y₀, y₁, R² and S in terms of d. Substitute these values in one of the general formulae also substituting the known values of P and f, and solve the equation for d. For sections No.2 and No.3 c=0. For section No.4 c = 0 and b=d. Section k-l should be deep enough to hold the load P in shear. Having determined sections k-l and m-n, and d, and r, the centers and radii must be found which give a hook pleasing to designer's eye.
NOTATION
R² = Square of radius of Gyration
S = Area of section P=load
f = Allowable fiber strain in pounds per sqaure inch.
American Machinist

Fig. 1

THE DESIGN OF CRANE HOOKS.

vantage, and we think that the molders are very much pleased with it."

There is nothing of sniveling philanthropy about this proposition, for the superintendent comes out plainly with the statement that a fair profit was made by the arrangement. There is money in it for the firm as well as the molder who earns the prize. If the plan had no other effect than of minimizing absence, it would be of value to the firm adopting it, for it is a well-known fact that a floor lying idle when there is work to be done upon it entails a material loss to the foundryman.—"Iron Molders' Journal."

Explorations and Travels in England.

BY W. H. BOOTH.

England is one of the strangest countries I have ever seen. Large numbers of Englishmen have gone at times exploring in Africa, and many of them have come back and written books about their so-called discoveries that can hardly be classed as either creditable or truthful. Where I am now writing is not 25 miles from Birmingham, one of the biggest and busiest cities in the country, but it seems to me that I have almost discovered this place, for it is difficult to see why it exists, how it got here, and to find anyone who knows of it. It seems to have been placed here for me to discover it, and yet I suppose it must be fairly known, for there is a railroad station here, not perhaps that this fact counts for very much, for the line is only the Great Western, a badly managed concern that runs very slow trains at very high fares and tries to collect charges on parcels before it delivers them to you, and you find on delivery that your goods have been burned and generally wrecked, as happened recently to a parcel of valuable books sent me from Paris, for the total ruination of which by fire the Great Western Company contrived to withhold compensation by a "slim" dodge that I would publish did I not fear to place the secret in the hands of other similar minded gentry.

Perhaps it is because of the poverty of the railroad service that Stourport is so little known to the outer world. It is here that there is a canal locked down to the River Severn, on which this old inland port stands, and where also the Stour joins the Severn. The Severn is historically a river of great interest. It was beyond the Severn that the ancient Britons were driven by the Anglo-Saxons, and, though not now the boundary of Wales, it may be termed so geographically, and must have been so in olden times. Indeed, it must have been the great barrier to the progress of the invading race for many years, for the old language is spoken more or less throughout Wales to this day, and is far from a dead language, though perhaps the most significant proof of its disappearance is given to-day by the special efforts made to keep it alive. The Severn at Stourport is a larger river than the Thames above London, though it is further removed from the tideway than what may be called the pleasure portion of the Thames. But this is not saying much, except for this country, where there are no really large rivers, and the Severn here is crossed by a single flat arch of cast iron, as regards its ordinary waterway, but by a bridge of many arches of brick and stone across the flat valley, which provide for times of floods, which come down in great volume.

This inland port looks unlike any place I ever saw, here or elsewhere, and, as though to accentuate the proposition with which I began this letter, it has that most up-to-date contrivance, an electric tramway, right from the old bridge through the town to Kidderminster, about 4 miles away, the line running, not on the high road, but on the cess, or side strip that is found along so many English roads, and which was instituted, I believe, in olden times for the benefit of flocks and herds when driven along the roads. All the way from the Bristol Channel the river is very full of interest in its associations. It flows by Gloucester, Worcester and Tewkesbury below here, and above this place by Bewdley, Bridenorth and Shrewsbury, and every place is full of history, which means largely blood and blazes, for there was more blood spilled over the objections of the ancient Britons to come into the union than even their descendants of to-day are spilling to uphold the union in another place. People who say that differences of race and language render political union impossible forget that in both language and build, and also in stature and cephalic development, the peoples of England and of Wales are more divergent than many French and Germans.

Except for its curiosity of place, however, Stourport is not of much interest, but only three miles away is Bewdley, which is a most ancient place. It is so old and broken-down looking as to give the impression of considerable poverty at first sight, but it appears that there is a certain pride of age about the place. The residents own their houses, and some are said to date back to the time considerably prior to that of King John, of Magna Charta fame, so that they should be some 800 years old, and thus far, no doubt, worthy objects of interest. But I do not credit this. The houses are at most about 300 years old. The *new* bridge here, which was begun in 1797 and finished in 1801, thus adds one modern feature to the town. It has three stone arches, and was built by that famous engineer, Thomas Telford, and, being so, it is hardly necessary to say that it is handsome, like all Telford's work. Needless to say, Queen Elizabeth once lived near here. It is a remarkable fact that one encounters all about the country in out-of-the-way places so many places where Queen Bess is said to have slept. She must have been a very sleepy old dame indeed, much more so than her accomplishments make us believe. We have only had three queens of any account, but of Queen Anne we hear far less than of Elizabeth, who preceded her by 150 years. It is because Elizabeth began the work, which Uncle Sam finished at Santiago, of teaching the then first Latin nation of Europe better manners than to come to London uninvited. It seems poetic justice that the colony of *Virginia*, named after her by Raleigh, who was done to death afterwards through Spanish influence with jingling Jamie, should, as one of the United States of America, finish Elizabeth's work. One wonders if the colony of Victoria, as one of the United States of Australia, will some day chase out of the Eastern archipelago the fleet of another Latin nation that is now threatening so loudly to visit uninvited the coast that was so fatal to the leading Latins of 300 years ago and is still the hope, to accomplish which even Alsace will be relinquished. Spain of old was hounded on by the rest of Europe, which abused poor Elizabeth and proved so plainly that the age of chivalry had gone by. Continental Europe to-day is proving by similar conduct that it is still steeped in barbarism, and is repeating history by egging France along the road that had its ending for Spain at Santiago. Yet the French cannot see why their Eastern neighbors are so anxious for them to imitate Spain.

A few miles up the river from Bewdley is Bridenorth, a kind of double town, one part on a high rock, the other part along the river bank. The two were joined originally by a steep flight of steps, that still exists, cut through the rock in places; but there is now a water-balance railway at an inclination of about 40 degrees, with two cars that pass midway up the slope, and are actuated by a tank of water under each car, that is filled or emptied according to the balance required and the load of passengers. The town is older looking than Bewdley, but contents itself chiefly with houses not above 300 to 400 years in age and an old castle, said to have been finally wrecked by Cromwell, and now an ornament of the public gardens. These old castles come in usefully. At Kidderminster the electric tramway offices are in the old castle keep, which is octagonal and has walls 6 feet thick and dungeons below.

The one thing that strikes me to-day so forcibly in these Severn valley towns is their air of sleepy comfort, and the unmistakable fact that though so comfortable to-day, they are but remnants of their former selves. They possess docks or well-built wharfs of heavy masonry that show by their solidity and dimensions that a big carrying trade must have been carried on before the navigation was destroyed by the railroads, and it is certainly through some bad management that there should be so very little use made of such a good stream as the navigable Severn.

It must appear curious that in such

short distances as 25 miles the country should vary so much. This is noticeable all over England, and the reason is that, geologically speaking, the rocks are tipped up at a very high angle, so that one does not walk upon their originally horizontally deposited surfaces, but upon their upturned edges. They are also much faulted, and coal fields are thus pushed up in the middle of otherwise agricultural country. The Black Country of England is an example of this. It is a very small tract of land indeed, and is simply a bit of coal-bearing country that is thus brought to the surface. It practically forms one great town, of which Birmingham is the chief portion; but a man could walk across the Black Country probably in an afternoon.

At Dudley there occurs a very curious formation in the shape of silurian rocks thrust right up through the thousands of feet of coal measures. These silurian rocks are pure limestone. Under the knobs thus pushed up the canal runs, and the quarries are underground. The limestone is quarried directly into boats, and the whole upheaval is traversed by huge caverns of an artificial as well as of a natural character. At a place called Kinver, on new red sandstone formation, are cliffs of very soft red sand, in which houses are quarried out, and any gaps are built up of brickwork, veritable cave dwellings, and I believe dry and quite habitable. These are probably the only Troglodyte dwellers in Great Britain.

The overhead system of electrical tramway construction met with a good deal of opposition here for some time. The opposition came less from the public than from the officials of the municipalities. In London the means of transport are very inadequate, and the municipal government has made every effort to prevent the spread, or rather the beginning, of electrical traction. Now that they have made a pretense at doing something themselves, they have been so badly advised as to adopt some conduit system that has not yet been invented, but is going to be. Anyone who has seen even the laying of a mere cable trench in any old town in this country would think twice before recommending a conduit system in London. The obstructions that are met with are so numerous that it is obvious the expense of the conduit system must be most serious. But for such municipal opposition there might ere this have been a line of electrical trams along every road out of London. The lack of such roads stops large numbers of people from living out of the crowded cities, and causes congestion of population. The curious thing about London is that all this stagnation is due to the County Council, that poses as the friend of the working man. We in London are thus compelled to waste hours on the steam lines, already overcrowded, while the colliers and ironworkers of the Black Country can ride to and from work in well-lighted electrical cars.

London.

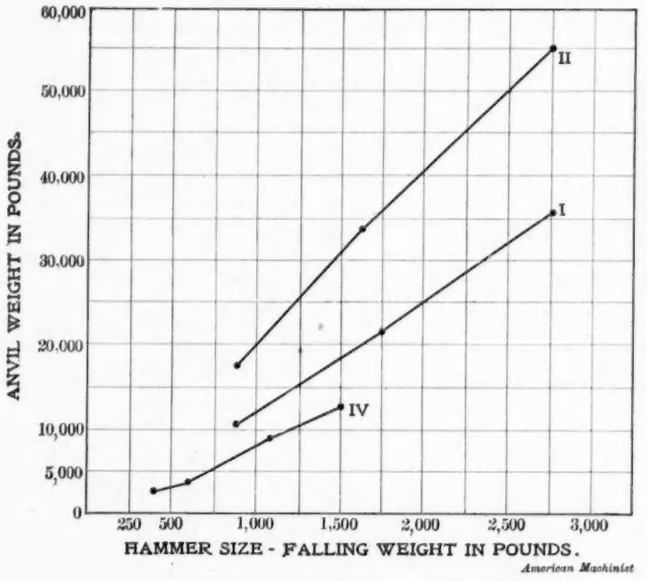


FIG. 1. RELATION OF WEIGHT OF ANVIL BLOCK TO NOMINAL SIZE GIVEN IN POUNDS OF FALLING WEIGHT.

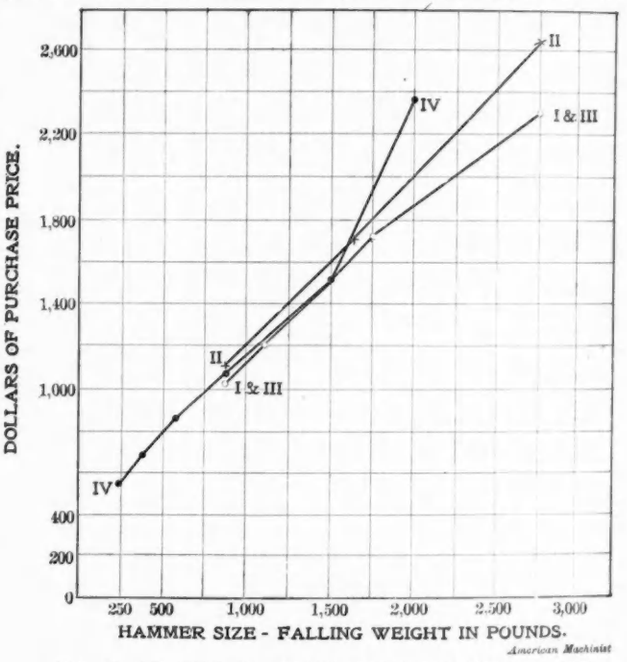


FIG. 3. RELATION OF PURCHASE PRICE TO NOMINAL SIZE GIVEN IN POUNDS OF FALLING WEIGHT.

Variation in Steam Hammer Design and Cost — German and American.

BY HENRY HESS.

About a year ago the writer had occasion to call for bids on three steam hammers. A comparison of the various hammers offered showed surprisingly great differences in fundamentals of design, and also in cost, that may prove not uninteresting to a wider circle.

The specifications called for three hammers, of 880, 1,640 and 2,740 pounds falling weight, the translation of the metric units to English measure being responsible for the odd weights. The hammers were to be operated by compressed air at about 100 pounds per square inch, with admission to both sides of the piston. The single standard type with angularly set anvil was selected, and it was further stated as a condition that the framework of the hammer and the anvil block must be independent. All of the hammers reviewed conformed to these requirements.

Granting good design and handiness of the parts, the most important element was considered to be the relation of the weight of anvil block to falling weight, especially as the police and building authorities were very strenuous in insisting on a high ratio. This at once put the purchase of American hammers out of the running, so that bids for these were not called for. The data from previous quotations for another firm are here introduced in order to contrast the practice of one of the leading American concerns with that of German firms of good repute. For obvious reasons the makers are referred to not by name, but by Roman numerals I, II, III, IV; the American symbol is IV.

Fig. 1 shows graphically the relation of the anvil block weight to falling weight. In the case of the German designs the increase in anvil weight is practically directly proportional to the increase of falling weight, but there unanimity of the designers ceases, as one considered it necessary to have from 1.57 to 1.75 times as much weight as the other; both put more metal in than their American fellow craftsman by as much as 1.44 to 2.4. As pig iron is a less costly commodity in the States than in Germany, the opposite tendency would have been considered probable by most people. As concern III did

not state the anvil weight it is not represented on this diagram.

The relation of the weight of the complete machine to the falling weight is graphically presented in Fig. 2. Here again is shown a surprising difference of practice, the ratio of German builders compared with each other varying between 1.52 to 1.64, and compared with the American, between 1.75 and 2.

A consideration of the total purchase price of the machines as referred to the size expressed by the falling weight shows a much closer agreement of practice, as may be seen by a glance at Fig. 3.

Fig. 4, in which is presented the cost per pound of the various machines, shows clearly the effect of the anvil block in reducing the cost per pound, as it is chiefly pig iron, with little labor expended on its finishing. The American, IV, is much the higher, with a relatively large drop of rate with increasing size, and a curious increase of that rate to the last size listed.

The workmanship and finish of the American hammers, IV, is considerably better than that of the German, and this justifies a rather higher cost per pound.

With similar weights in the anvil to satisfy the authorities, the orders for the hammers would most likely have gone to the States, provided that cost of shipment of the heavy anvil did not introduce a prohibitive factor. As it was, it went to No II of the German competitors, which also of those highest in total cost (see Fig. 3) combined greatest machine and anvil weights with least cost per pound (see Fig. 4), with workmanship at least equal to that of the others, while approaching the American in simplicity of design and convenience of handling.

Berlin.

Progress in the Use of Aluminum.*

Here is a small box containing a dozen aluminum thimbles which was sold in the largest store in this city this week for 5 cents. This furnishes me a good text to talk about the displacement of other common metals by aluminum. These dozen thimbles weigh less than half an ounce, and the aluminum in them cost the manufacturer just 1 cent. If he had made them of common brass they would have weighed 1½ ounces and the metal in them would have cost 1¾ cents, which is an increased cost of metal of 75 per cent. Or, stating it another way, to manufacture $1,000 worth (selling price) of thimbles, the manufacturer would have to buy to make them (allowing 25 per cent. for waste clippings) $250 worth of sheet aluminum or $437.50 worth of sheet brass. The general public considers brass as a cheap metal, and such facts as the above are rather startling when first grasped.

Coming to the city in the train to-day, I estimated the amount of brass fittings on one railway car as about 300 pounds. Without exception they were replaceable by light aluminum alloy, which, fully as strong, would weigh only 100 pounds, and cost only two-thirds as much. The difference in cost would probably amount to $20 per car in favor of aluminum, while the saving in dead weight hauled would be more than the average weight of one passenger per car.

The next great improvement after that of the fall in price, has been in the successful manufacture of light, strong alloys. This has been a subject at which metallurgists have worked hard and long, and their labors are bearing fruit in abundance. Pure aluminum has many resemblances to pure copper. Take away the red color of copper, and its softness, malleability, toughness, silky fibrous fracture are almost exactly duplicated by aluminum; but they are both soft, rather weak, metals. Five per cent. of aluminum, silicon or manganese, or 30 per cent. of zinc added to copper make famously strong bronze or brass.

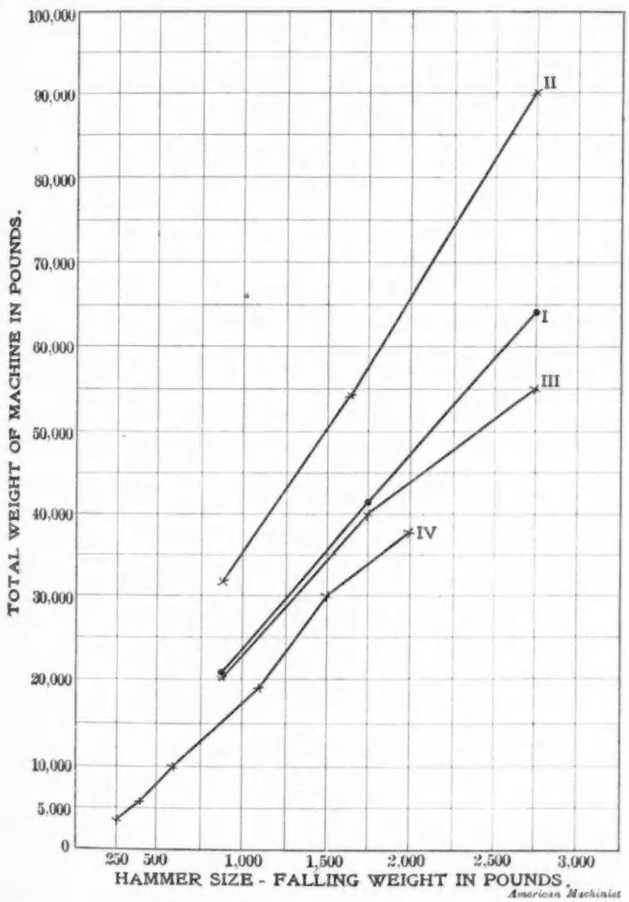


FIG. 2. RELATION OF TOTAL WEIGHT OF MACHINE TO NOMINAL SIZE GIVEN IN POUNDS OF FALLING WEIGHT.

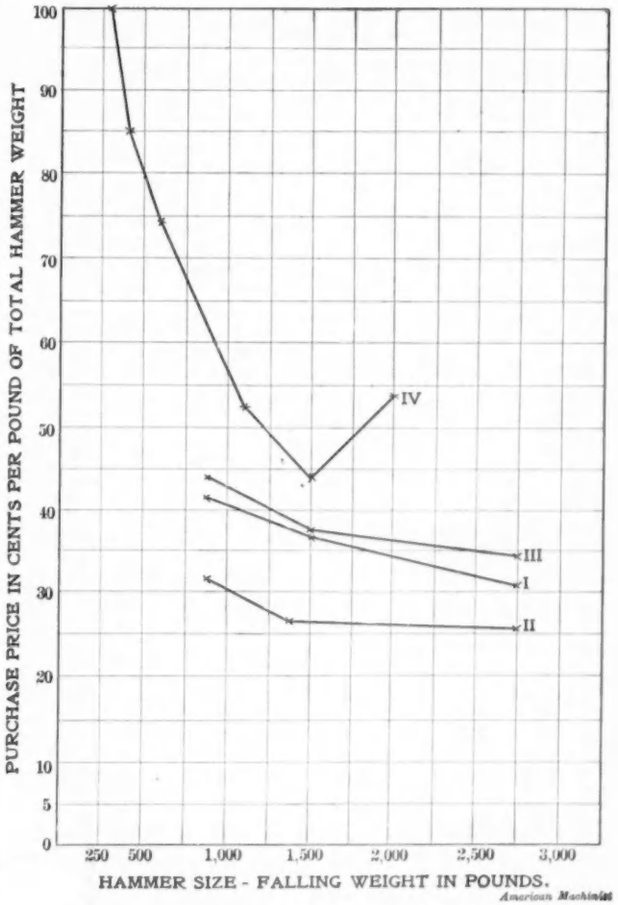


FIG. 4. RELATION OF PURCHASE PRICE TO WEIGHT OF ENTIRE MACHINE.

*From a paper by Prof. Joseph W. Richards, read at a meeting of the Franklin Institute.

Similarly, 5 per cent. of copper, nickel or manganese or 30 per cent. of zinc added to aluminum make strong metals, as rigid as bronze, yet only one-third as heavy. Such light, strong, good casting and machining alloys have an extremely large field of usefulness, and will receive a very large application in the near future. The alloy made by the Delaware Metal Refinery, of Philadelphia, is one of the best. It is a hard white alloy, specific gravity 3.1, melts clean, runs fluid, makes beautifully sharp and perfect castings, turns and machines like the finest brass, polishes well, and, to conclude, is fully as rigid and strong as gun-metal or the best of the ordinary bronzes. I do not enumerate this catalog of virtues merely from my own knowledge of the alloy, but could substantiate it from the experience of Philadelphia firms who are using it regularly and are quite enthusiastic over its possibilities. This alloy is principally of aluminum and zinc, and sells at the same price per pound as pure aluminum. The field of application of light alloys with such properties to light-running machinery, portable apparatus, vehicles, instruments, etc., is almost immeasurable, and the next few years will see its use very general for such and similar purposes.

The use of aluminum for culinary utensils is extending steadily, as their merits become better known. A brief statement of what they are for this purpose is that they possess all the advantages of copper utensils, with none of their disadvantages. The first aluminum utensils put on the market, ten years ago, were generally too lightly made, and were consequently easily dented and bent out of shape. The manufacturers have learned by experience, and the ware now being sold is fully as durable as the best copper ware. An aluminum kettle in my father's house has been on the stove constantly for seven years, boiling Schuylkill water, and is apparently uninjured and unworn. The inside has a brownish adherent skin of oxide which seems to be continuous and to efficiently protect the metal beneath from further oxidation. It bids fair to become an heirloom in the family. The aluminum goods need only as much attention as ordinary tinware to keep them bright and clean. Bath-brick dust, such as is used for polishing knives, is as good a scourer as can be used on them.

As a distinct novelty in aluminum goods may be mentioned the beautiful ware being made by the native metal workers in the bazaars and industrial school at Madras, under the leadership of Mr. Chatterton. These native workmen are probably the most skillful metal workers in the world, and their work is principally confined to steel arms, silver ornaments and copper and brass utensils. The fact that aluminum sheet blanks can now be purchased cheaper than similar sized blanks of copper or brass has given the opportunity to introduce the working of aluminum. The natives have easily mastered the peculiarities of the new metal, and take most kindly to it. The native Indian troops are largely supplied with aluminum ware, and it is coming into favor in all castes, from the lowest to the highest, on account of its lightness and cleanliness, while costing no more than copper or brass utensils.

It would be useless for me even to attempt to name all the various goods which are now being made of aluminum, in which its lightness and prettiness are much in evidence. The toilet goods and pocket articles are especially in favor, and aluminum combs are being made by tens of thousands, and consuming a generous share of all the aluminum sheet made. An equally large use is for fruit-jar caps, for which aluminum is superseding zinc, although more expensive, because of its harmlessness.

In the artistic branch of *lithographic printing* aluminum is rapidly winning an important place. Nearly two years ago, speaking in this hall about the progress of aluminum industries in Europe, I spoke of the establishment I had visited at Mainz, which printed altogether from aluminum plates. The process was then quite new, but since that time about thirty firms in the United States alone have taken up the aluminum plate printing, and are using it regularly, while the number in Europe is probably forty or fifty.

Electric conductors can now be laid more cheaply in aluminum than in copper. This is indeed a startling statement when first heard, for almost everyone is wont to consider copper as the metal *par excellence* for conductors. But pure aluminum has over 60 per cent. the conductivity of pure copper, and is fully as strong and resistant to atmospheric influences. It is therefore only necessary to take an aluminum wire as large again in diameter as a copper wire (giving a little over 50 per cent. more section) to get equal conductivity. Such a wire weighs one-half as much as the copper wire it replaces, and costs only two-thirds as much. Long-distance transmission lines and trolley line feed wires are being put in in aluminum as fast as the makers can supply the metal. Over 500 tons of aluminum were used for this purpose last year, and probably double as much will be used this year. As 500 tons supplant 1,000 tons of copper, it will not be long before the copper industry will begin to feel the competition of aluminum, but will probably be unable to meet it. This one use of aluminum promises in the near future to consume its thousands of tons a year.

I will close by referring to *powdered* aluminum and the many applications it is receiving. Aluminum can be rolled out to $\frac{1}{2000}$ of an inch in thickness, and then beaten out to $\frac{1}{40000}$ or even $\frac{1}{70000}$ of an inch. As thin sheet it has found some application in place of cardboard, for business cards, etc., but as leaf it has entirely superseded silver leaf in decorating. This leaf can, moreover, be ground to powder, and in this condition is used by printers for silvery printing and as a paint. For the latter use it is simply mixed with a varnish, like ordinary bronzing powders, and has already proven its beauty and utility on Uncle Sam's letter boxes.

The powdered aluminum has recently received an extremely interesting metallurgical application in the reduction of refractory metallic oxides to the metallic state. Over forty years ago Tissier proved that aluminum energetically reduces some metallic oxides. He mixed the metallic oxide with aluminum powder, heated it in a furnace, and generally succeeded in reducing the oxide to metal, and, in some cases, reducing the furnace to ruins.

A Job in Drawing and Forming Sheet Metal.

BY JOSEPH V. WOODWORTH.

The piece to be made was a shoe clasp, or hook, for laced shoes, with a ball 17-64 inch in diameter at one end and an eyelet, cup shape, at the other 17-32 inch deep by .185 inch in diameter of the small part and 19-64 inch in diameter of the large part, with a ⅛-inch hole in the bottom, drawn from soft sheet brass .022 inch thick, finished and formed, as shown, slightly exaggerated, to bring out its points better, up at the right of Fig. 6. The object of the ball, instead of the flat, projecting hook now in use, was to prevent the lace from catching or tearing.

After much discussion we concluded that the cheapest and quickest way to get out a few sample lots for trial was by the following set of dies, which I have endeavored to show as clearly as possible in the drawings, showing the work in two views after each successive operation, Fig. 1 being the first, and so on to Fig. 6, which is the last.

It took eight operations to produce the result shown in Fig. 6, all of which were done in the foot press, with the exception of the first, which was done in the power press by blanking two at a time, as shown in Fig. 8. Of course, the blanking die was made last, as it took some time, work and patience to find the exact shape and size; therefore the drawing and bending dies were made first.

The first punch and die is shown in Fig. 1, the blank being shown up at the left. *B* is the die, of round tool steel, 1⅛ inches in diameter, turned and finished in the way shown. We then finished out a die block so that the dies for the various operations would fit in it, thereby saving a separate die block for each operation. The drawing shows a gage plate *C*, fastened with two screws, shown, and two dowel pins, not shown; also the push-out spring and headless screw *D* for adjusting at the bottom. The die was finished with

a butt mill to template. *A* was the punch, of ½-inch tool steel, worked down and finished with a hand tool to template; that is, two thicknesses of metal less than the die in diameter. They were both hardened and drawn, the result appearing up between Figs. 1 and 2. Fig. 2 shows the punches for the second operation, on the same plan as Fig. 1, except that the eyelet is drawn to the finished size. *E* is the punch, *G* the gage plate, *F* the die and *H* the adjusting screw. The result is shown up between Figs. 2 and 3.

Operation No. 3 is for piercing the hook in the eyelet. *N* is the die, *O* the gage plate, *I* the punch holder, *J* the punch of Stubb's wire, *K* a piece of ½-inch round spring rubber and *M* two pins for holding the stripper plate *L*, the plate moving up and down freely when the rubber is compressed. The rubber acts as a spring to strip the work from the punch.

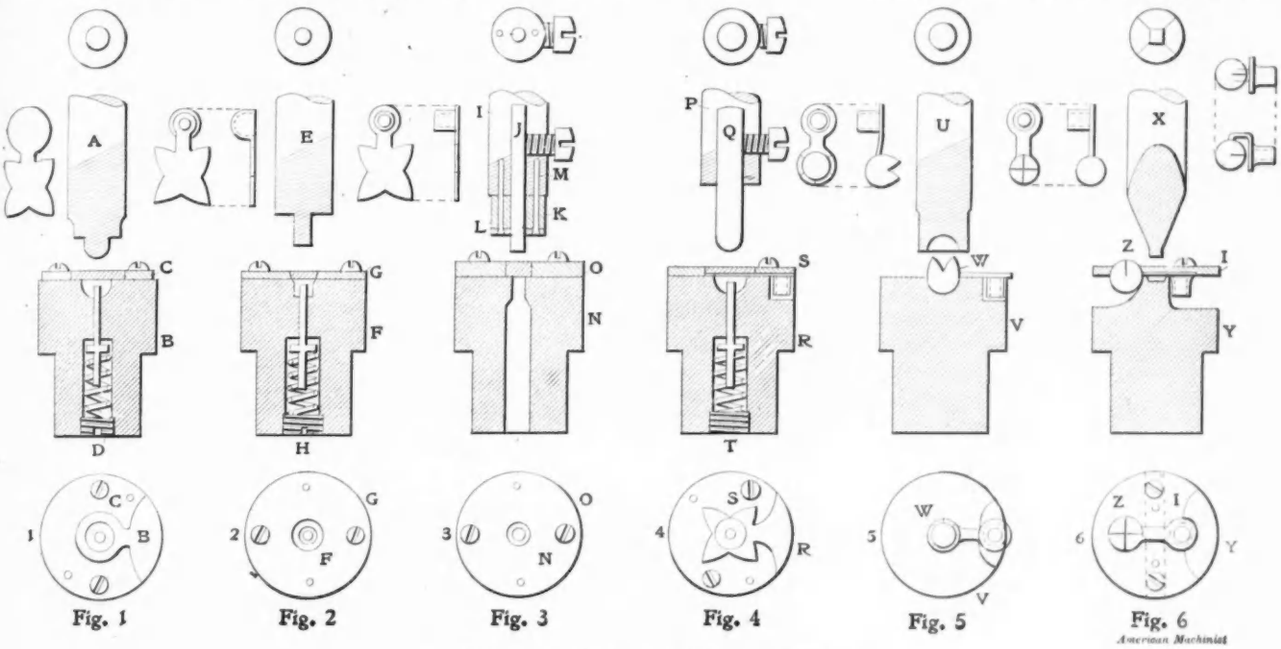


Fig. 1 Fig. 2 Fig. 3 Fig. 4 Fig. 5 Fig. 6

FORMING SHEET METAL IN SUCCESSIVE STAGES.

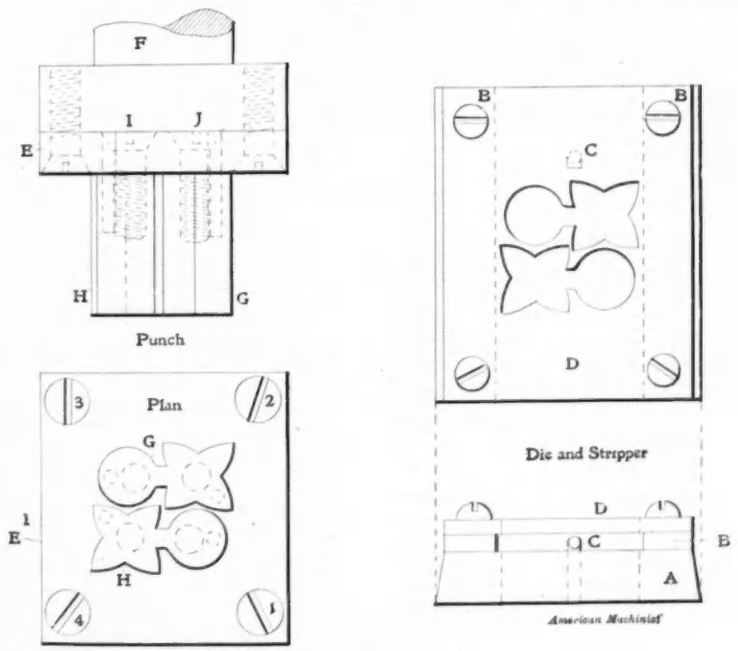


Fig. 8

PUNCH AND DIE FOR THE BLANKS.

Fig. 4 shows the fourth operation of drawing the other ends; that is, half forming the ball. *P* is the punch holder, *Q* the punch held by screw as shown, *S* is the gage plate, *R* the die and *T* the adjusting screw for the push out. The finishing of the ball is shown in Fig. 5; the punch and die are respectively finished out to one-half of a sphere 17-16 inches in diameter, *U* the punch, *V* the die and *W* the work in position, the punch descending causing the four wings to close in, thereby filling out and forming the ball round enough to satisfy the eye, if not quite perfect.

The drawing of the work being finished, the next operation was to bend and form it to the shape shown up at the right of Fig. 6, which was done in the following manner: Fig. 6 shows the first bending with the work in position. *X* is the punch.

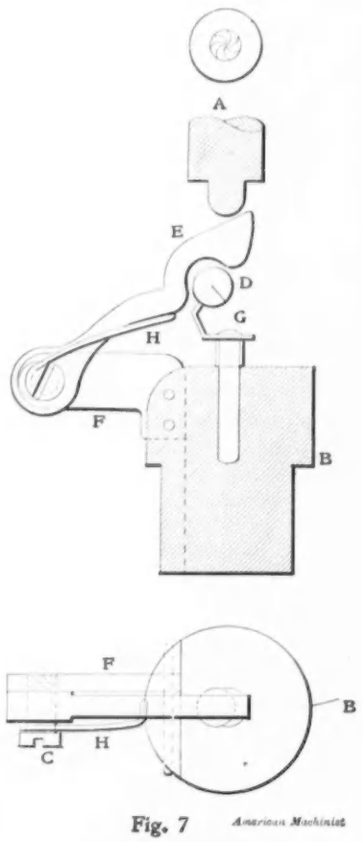


Fig. 7

LAST BENDING OPERATION.

Y the die, *I* the gage plate and *Z* the work. The result of this operation is shown in Fig. 7 in position for the next and last operation, which was done in the way there shown. *B* is the holder, *G* the horn to hold the work, *E* the bending rig, which was of tool steel swinging on arm *F* and held by shoulder screw *C*, *H* being a flat spring to bring it back to place. It was worked out in the way shown, and this completed the job.

The blanking die was made in the manner shown in Fig. 8. *A* the die, *B B* the gage plates, *D* the stripper, and all held in place by the four screws as shown; *C* was the stop pin. By blanking two at a time the work was finished quicker and with less waste than otherwise. *F* was the stem or punch holder, *E* the pad held by the four screws 1, 2, 3, 4, and *H G* the punches, held in place by the two screws *I* and *J*, with two stiff dowel pins to each. The die was carefully hardened so as to retain its shape, as the slightest variation would have caused a heap of trouble.

Brooklyn, N. Y.

A Crowbar Breaks into Four Pieces.

The half-tone here given tells the whole story, so that there is scarcely a word to be said, and in fact we have no information other than is given by the picture. The bar was 8 feet long, and it was 2 inches square where, presumably, the initial break occurred. The next fracture was where the octagon part ended, while the third was in the round part. We understand that there were no indications of cracks or flaws where fractures occurred. We are indebted to Mr. P. H. Briggs, of Carbondale, Pa., for the photograph.

THIS BAR WAS BROKEN IN FOUR PIECES BY FIVE MEN WHILE PUTTING A SPRING ON D. & H. ENGINE NO. 43.

Letters from Practical Men

Shavings Burying Chips.

Editor American Machinist:

It seems likely that we may soon have to give up the use of the saying that "a workman is known by his chips." This used to be said in commendation of the workman: "the more the chips the better the man." We can't use it that way any more, or at least the saying is getting to be less commendatory every day, and in the not distant future it is not improbable that a workman will resent the saying as an insult if applied to him. Before long it may be only the incompetent and inferior workman, or one who is poorly equipped, who will be known by his chips. The tendency of the times in the manipulation of metal is decidedly more promising for the production of shavings than of chips in the future.

Not long ago we might have said with truth that one of the most noticeable differences between the carpenter and the machinist was that one was a maker of shavings, while the other made only chips. All that is changing now; and why shouldn't it? There is now no reason in the nature of things why, as a rule, steel and iron should not be cut in shavings instead of in chips. Of course, in olden times it was different, and chips then had a right to be. The carpenter used his jack plane and flooded his shop with shavings, because it was easy for him to do so. The iron worker, with his hammer and chisel, or with a tool nibbling away at a piece in the hand lathe, made chips simply because he was not able to make shavings. Now that the full opportunity and ability to make shavings instead of chips has come upon him, he has been slow to realize and take advantage of it, but his eyes are opening. With the material that he now has to work on, and with the tools that he now directs, instead of driving them by the force of his own muscles, it is easier to make shavings than once it was to make chips. Why does he still make chips then? Well, he is making fewer and fewer, and he will make still less when he fully realizes that it is so seldom necessary to make them.

The mild steel that we now handle so generally is most delightful material to work. At least, it came as a delightful experience to those of us who saw the first coming of it. We could only compare its fresh lustre to silver. "It cuts like cheese," a fellow says, and it is a curious thing that whoever says that always says it in praise of the stuff he is talking of. He never means rotten cheese on the one hand, nor dry and petrified skim-milk cheese on the other. Swiss cheese, if it was only without blow holes, is about the idea. This modern steel is of precisely the same texture and hardness, or, rather, softness, all through, and is absolutely without grain, so that in this particular it has one decided and great advantage over wood, in that shavings may be cut in any direction, and from every side of it, with equal facility. A cube, a sphere or a cylinder of mild steel may be cut on every side of either, and always with shavings instead of chips.

I must confess that I have been as slow as the rest in realizing all that can be done with modern steel. The other day I saw a man who had perhaps fifty samples of different articles, such as keys, feathers and similar pieces, from 6 inches long down to an inch or so, that he is manufacturing in quantities for machine shops and others that may want them. There were some keys with heads for drawing them out, and feathers with central projections on the under side for holding them in position. Nearly all the surfaces of all the pieces were flat, and I made a remark of some kind about the number of milling machines that must be kept in operation to produce them all. I was assured on the spot there were no milling machines employed in their production, and that, in fact, there was no milling machine in the shop where they were made. All this work was done by flat cuts, and the metal was all removed by shavings. That, I suppose, is what you might call a modern shop working by modern methods.

Not long ago I was in a big works where they were making a lot of conical shells for Uncle Sam. The shells that I saw were, I think, 5 inches in diameter, with a straight part, say, 8 or 10 inches long, and then the conical end. Of course, the straight part had to be turned very accurately to gage to fit the bore of the gun. The way they turned them was not to turn them at all. They were just forced by a powerful hydraulic press endwise down through a round die. That was making shavings for you.

Steel wool, which sells for a dime a pound, or something like that, shows how easy it is to make shavings of steel if we want to. In the production of that they cut the steel all up into shavings without making a single chip, after they get fully going. In general machine shop work we don't want to go into the making of shavings merely for the sake of the shavings, or for the fun of the thing, but because shavings represent continuous and precise cutting under the most economical conditions. Chips necessarily imply that something is wrong. If the cutting is intermittent, as with a hammer and chisel, that makes chips. If the material is rotten or full of blowholes, then we have chips. If we haven't power enough to take sufficiently broad or heavy cuts, we are apt to have chips instead of shavings. If we have good material and power enough and a correctly shaped cutting edge, and then do not leave room for the

shaving to flow away as it should, but compel it to roll up upon itself in tight little curls that continuously break, we have to call the result chips instead of shavings. It is possible to hold or to drive work so firmly, to apply such power in the driving, to prepare a tool with such a precise shape and temper, to hold it with such rigidity and adjust it so minutely that shavings, and only shavings, will result, and that is good work. If chips are produced instead of shavings, the presumption must be that something is defective in our practice. What has the milling machine to say for itself? TECUMSEH SWIFT.

A Device for Backing Off Counterbores.

Editor American Machinist:

The following method of backing off counterbores has been in use for two or three years with good results, and I offer it to those of your readers who may have a number of such tools to make. As will be seen by the assembly drawing, Fig. 6, it may be attached to the ordinary toolroom lathe.

Figs. 1, 2 and 3 represent respectively the plan, side and front of the casting bolted to the carriage, and also held by two dowel pins to insure perfect alignment. Through the top of this casting is a hole, bored in line with the centers of the lathe, containing a hardened steel bushing, ground true inside and out, and which fits the shank of counterbore so as to allow it to revolve freely, different bushings being used for different sized shanks. The other end of the shank is held against the combined face plate and cam by dog and strap, as shown.

This cam, as shown in Fig. 5, was made for four-fluted counterbores. It is a casting similar to an ordinary face plate, in which is bedded a hardened steel ring *A*, against which the cam roller, shown in Fig. 4, bears. The roller stud, which is threaded and provided with an adjusting nut, fits in the hole *B*, the square part bearing against surface *C* to prevent the stud from turning.

The roller is held firmly against the cam by the helical spring seen in Fig. 6, which is compressed between the carriage and the clamped tailstock. The spring does the work of holding the tool to the cut during one-quarter of a revolution of the cam, the raised parts of the cam acting against the spring to push the tool away from the work so as to allow the teeth of the counterbore to pass. The device probably requires no further explanation.

S. B.

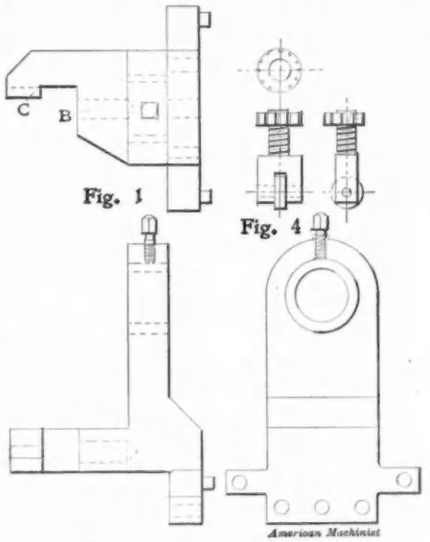


Fig. 1 Fig. 4

Fig. 2 Fig. 3

DEVICE FOR BACKING OFF COUNTERBORES.

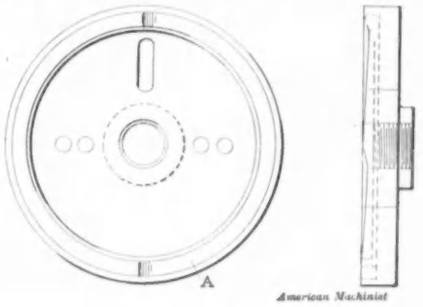


Fig. 5

FACE PLATE CAM FOR BACKING-OFF DEVICE.

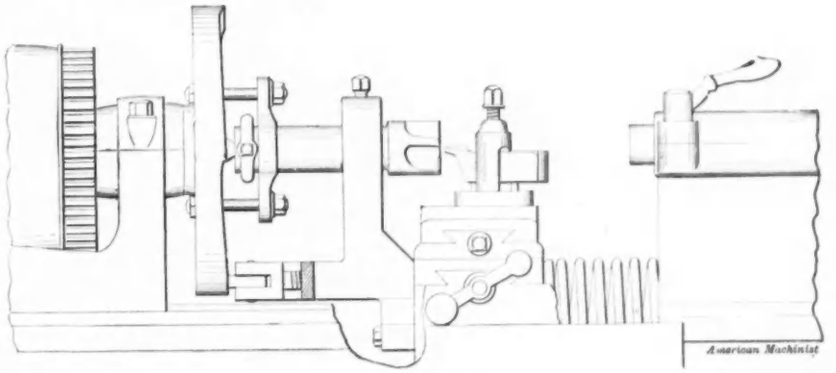


Fig. 6

THE COMPLETE DEVICE IN OPERATION.

The English Discussion of Tool Rooms.

Editor American Machinist:

That "English Discussion of Toolrooms," printed in the "American Machinist," No. 21, is particularly interesting and instructive, in that it illustrates the attitude assumed on the other side of the Atlantic towards one of the essentials of machine shop. I say "essentials," because I believe that where there is a live, up-to-date shop there must necessarily be a progressive toolroom and one that keeps pace with the manufacturing department. It is my opinion that we should have to look a long while for an American shop that had been running any considerable length of time that did not have its toolroom of some sort. To be sure, some of them leave much to be desired, but it is usually the case that where the toolroom is afflicted with general debility it is owing to a similar state of affairs throughout the whole shop.

It is evident from the remarks made at the Manchester meeting, that while many mechanics in England believe in toolrooms, there are others who have some doubts as to the advisability of installing them in all shops. Doubting Thomases of this kind can be found quite generously sprinkled over England, as many Americans who have installed machinery in that country will be ready to affirm. And the lack of toolrooms has been very often exceedingly troublesome. It is to be hoped that some such machine-tool equipment as Mr. Heap suggests will be adopted in all places where such machinery is not already in use, for there is nothing that has caused much more expense or trouble in certain English shops than this absence of proper means for making tools and keeping them in working order.

I recall setting up, not so very long ago, some machinery in a large works where the only means for grinding tools was a stone, averaging possibly 3 feet across. It was considerably more than this at some points and less at others. One of the men with a bar of iron managed to reduce some of the high spots, but there was still such an undulating, twisting surface, such a come and go, that it was impossible to grind anything in the nature of a special tool. Upon inquiring what was used when there was a good job of grinding to be done, I was informed that that was the best piece of grinding apparatus about the works, and that all tools that could not be ground on that were annealed and filed. My informant appeared to be honest, and upon investigation I found he had been stating only facts. Furthermore, I discovered that they were as badly off for other toolroom machinery as they were for grinders. When the special tools I was using became dull I had to take them to another place to have them ground. This concern was only one of many with whose methods I have been acquainted, who paid very little attention to the keeping up of their tools.

Mr. Heap, among other good sugges-

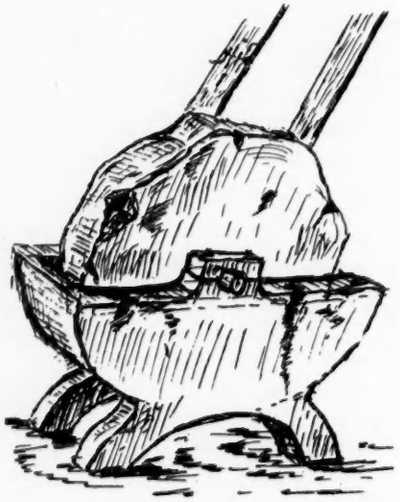
tions, recommends that a draftsman be kept in the toolroom drawing up jigs, etc., and I feel safe in saying that that draftsman will be one of the busiest men about the place.

I notice that in the discussion of the paper, it was remarked that there might be a difficulty in keeping the man or men in the toolroom steadily employed. It strikes me that there is little danger of anyone getting time for a nap while on the job. When I was one of the boys behind the screen, I nearly ran my legs off answering calls at the window, and it wasn't a large shop either. Between trips I managed to get more practice in the art of twist-drill grinding than I have ever had since. And grinding twist-drills is only one of many things that have to be done in a toolroom.

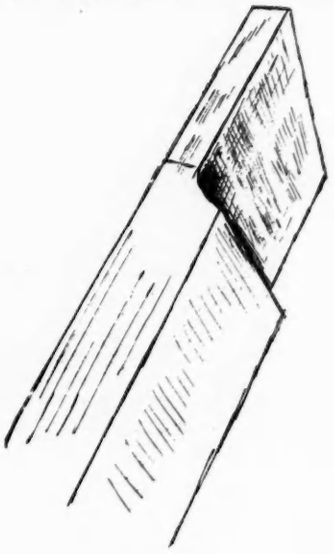
The point brought out by one of the speakers at Manchester, that it would be difficult to start a toolroom in a works already established, owing to the men being acustomed to a certain routine, seems a little like putting the blame for the absence of toolrooms upon the workmen. While it is supposed that the English mechanic is sometimes a little less eager than his American brother to welcome innovations, it would still seem as though he would be as willing to walk up to a toolroom and receive a tool in first-class order as to be obliged to hunt all over the shop and eventually find the article wanted stored away in someone's private corner.

There is one thing in connection with this Manchester discussion that surprises me somewhat. I find in the report, as printed in the "American Machinist," no reference made in any manner, direct or indirect, to American toolroom practice. Yet there were probably men present who were acquainted with some of the systems in operation here. At this time, when so much is being said and written regarding American competition in British markets, it would seem as though this highly important feature of the successful American shop would receive some special consideration.

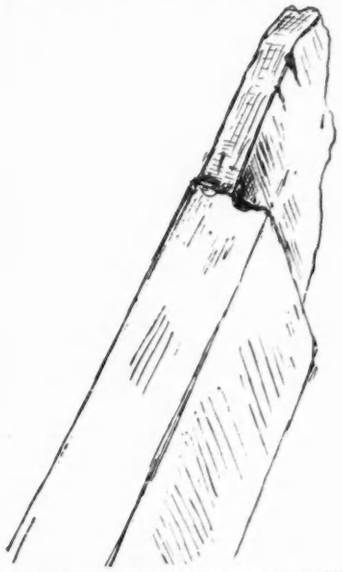
F. A. STANLEY.



A SPECIAL TOOL GRINDER SOMETIMES SEEN IN OLD-ESTABLISHED WORKS.



WHAT THE GENTLEMAN AT THE TOOLROOM WINDOW WILL GIVE YOU.



WHAT YOU FIND WHEN YOU HAVE TO LOOK AROUND THE SHOP FOR IT.

Echoes From the Oil Country—I.

Editor American Machinist:

I told you I would some day strike out for myself, and now I have done so.

I think myself pretty well up in the trade for a young man.

After serving my time with the most noted fine-tool company in New England, working two years on marine work, having a turn at the armory, graduating in mechanical engineering from the correspondence school, and being leading man in the making of tests and correcting of mechanical defects in the expert work of my friend, Professor S——, of whom I told you, I thought it time to branch out; so when I saw an ad. in the "American Machinist" for a foreman in a small shop doing general work, I made bold to answer it. I said I had a good knowledge of all classes of work, was a hustler and could get out all sorts of work on short notice and was well posted in ways for cheapening output, etc. Salary to be according to ability I display in reaching results, and was willing to go anywhere in the United States.

Got word that they would pay $4 per day to start with, and if that was satisfactory to come at once to Petroleum Center, Pa., and take charge of Smith's shops on Bonanza Flats. After some trouble I located the place on an atlas, but could not find out much about it, except that it was in the oil country.

I didn't know much about that section, except what a friend at the boarding-house told me. He had been draftsman for a concern somewhere in the oil country, and said everything was rough, the country (mostly set up edgewise), the machinery, or what they called machinery, and the natives, and that a good man with first-class ability wasn't appreciated, and so he left.

He thought I might get along a little while if I didn't say anything to let the folks know I was educated, but I had better keep enough money to buy a ticket back East.

You can't fly by sitting down flat on the ground, and I just wanted to try flying once, so I wrote I was coming. The ride there was the usual thing, until I left Corry, on the main line. Soon after that I began to see wooden derricks and smell oil. The ride was down Oil Creek, and the farther down I went the higher the hills and the narrower the valley; the farms got scarcer and the scenery wilder.

At one place a vile stench filled the car, and visions of a soap factory filled my mind; but a man sitting with me said, "Acid works." I saw some large buildings, a row of houses some distance away and the usual hills, those nearest to the works being bare of vegetation. The smell I have bolted and double riveted to my memory.

I learned that sulphuric acid was made there and was used to treat the oil in refining it and to help make nitro-glycerine, of which large quantities are used to "shoot" the wells. My seat-mate pointed out a man in the car, who he said was a "shooter," and whose ordinary occupation, as I gathered it, seemed to be driving around the country with from 30 to 120 quarts of nitro-glycerine under the seat, and over roads more fit for goats than for horses and wagons. I learned more of them and their ways afterwards.

Arriving at Petroleum Center, I found a few houses, a narrow valley and hills and woods, with Oil Creek in the foreground, and was directed to Smith's shop.

Did you ever see a real country job

shop, one ready and willing to tackle anything that could be brought within range, and even ready to transport a good share of the shop to the job if needed?

I wish I could send you some photographs.

Imagine, if you can, several one-story buildings of various hights and shapes pushed together with numerous warts protruding, with roof of shingles, boards, slabs, sheet iron and roofing paper; several doors large enough to drive into, a platform by one the hight of a wagon. The "shop" and foundry lean lovingly together, while the blacksmith shop and boiler shop are close by; the boiler shop overflowing an unknown distance into the surrounding country.

As I walked up I saw several styles and makes of steam pumps (nine, I afterwards found out), steam engines of various makes, a traction engine, a road machine, a stump puller, a water wheel, a threshing machine, a windmill, six boilers, two plows, a mowing machine and large piles of pipe from 8 inches diameter down. Some of the pipe had nice new threads on, but the pipe itself all looked as though it had been used.

While there seemed to be very little town and not much shop, the outlying country seemed to be pretty well filled with stuff to work on.

A very greasy, good-natured man with a pipe in his mouth, his pants in his boots, without coat, and with a gold chain hanging to a very dirty vest, met me at the door, as did also a very peculiar odor of crude oil and machine shop combined, and on my inquiring for Mr. Smith, he said some folks called him that, 'though most of them called him "Bill"; it didn't matter which, just so they called him when they wanted some work done—and what could he do for me?

On introducing myself I was very warmly received. He said I must excuse his not having his dress suit on, as he had just come from the "lease"; had to go up to have his oil run, and had been trying a new "thief" he had been making. Told me to make myself at home and look around a little while he washed up, and he would take me down to the boarding-house and get me settled. He didn't expect I would want to just dig in the first thing, but might like to look around a few days and get acquainted.

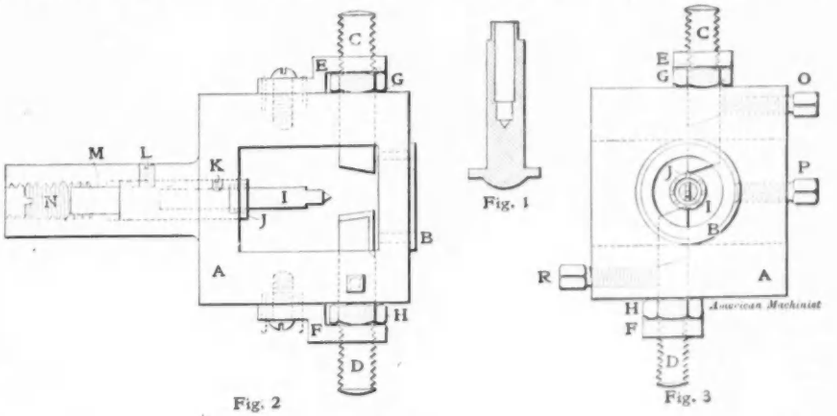
As I stepped into the shop, I saw scattered around, it seemed to me, almost everything in the way of parts of machinery, and in all stages of dirt and distress—parts of engines and pumps, a hydraulic jack, a lot of square thread screws about 4 feet long, some thicker ones about 2 feet long; but what attracted my attention the most were various strange-shaped pieces, some threaded on one end and some on both, some threads internal and some external, but all with a very stiff taper on—about 1 inch in 4 inches, I afterwards learned. These pieces seemed to be treated with more respect than the other things; but what they were or how they were used I didn't know.

For tools I found a 24-inch by 24-inch by 6-foot planer, a 28-inch by 16-foot lathe, a 24-inch by 8-foot lathe, a 2-inch pipe cutter and a post drill, or at least it would have been a post drill if the post had gone to the floor. It had been cut off about 4 feet up and the bottom removed, which gave them a drill that would drill to the center of about 18 feet if necessary. A small blower, a wheesely upright engine and the back end of a boiler filled up most of the spare room. W. OSBORNE.

A Box Tool.

Editor American Machinist:

The tool which I will describe has some points which will, I think, commend it to your readers. The work is seen in Fig. 1, which shows a cross section of a pneumatic tire valve, partly finished. It was made of round brass ⅞ inch in diameter by 2 inches long over all, the head left full size and the stem finished to 17-32 inch in diameter for the large part and 19-64 inch for the small part, with a ¼-inch hole down through the center 15-16 inch deep, ending in a square shoulder, and a smaller hole, 3-16 inch in diameter, 5-16 inch deep, ending in a conical point, to act as a valve seat. This was all done (except the shaping of the head) in the box tool Figs. 2 and 3, which show the side and the front respectively.



A BOX TOOL.

The principal piece *A* was a machinery steel forging, first turned on the centers, leaving the shank ⅞ inch in diameter and the front faced off. It was then chucked true by the stem, when the hole was bored to admit the bushing *B*, which was of tool steel hardened, ground and lapped to size. The temper was not drawn; it was simply warmed to take the chill out, so as to wear better. A hole was then bored straight through the shank. The piece was then removed from the chuck and the hole tapped from the back end to admit the adjusting screw *N*. The oblong hole across the body was then got out, first by drilling and then by shaping to size. *J* was a hollow mill 19-64 inch inside, and turned on the outside to fit the hole in the shank. The screw *L* held it in place. *M* is a piece of round steel used as packing endwise between the screw *N* and the hollow mill *J*. *I* is a flat drill, turned, finished, and held by screw *K*.

Two holes ⅜ inch square were then worked through the body, one from the top and the other from the bottom (the top one 1-32 inch in advance of the other) to allow the cutting tools *C* and *D* to enter with their cutting faces in line with the center. *E* and *F* were two brackets of machinery steel worked out to the shape shown, with a ⅜ inch square hole through each (to admit the cutting tools), and fastened in line with the holes in the body by the screws and dowel pins as shown. The tools *C* and *D* were rounded on their outer ends, with a thread 20 pitch half way down their length fitting the adjusting nuts *G* and *H* smoothly. After the cutting tools *C* and *D*, the hollow mill *J* and the flat drill *I* were hardened and drawn, the various parts were assembled and the cutting tools were adjusted by turning the nuts *G* and *H* so that the top tool would take the heavy cut and the bottom one the finishing cut. The set screws *O* and *R* held the tools in position; the set screw *P* held the bushing. The box tool was then completed and ready for the work, which it did very well.

JOSEPH V. WOODWORTH.

Brooklyn, N. Y

The Dearness of Cheap Labor.

Editor American Machinist:

In the "American Machinist," No. 20, you speak of foreign trade possibilities. Among other things, you say that Consul-General Wildman takes the position that the opening in China for the sale of machinery is limited on account of the cheapness of hand labor, and further on he is quoted as saying: "Machinery at present cannot compete with cheap labor." Right here please allow me to state my experience with a Southwestern concern which desired me to fit it up to do a certain class of work right at the mines, or near there,

using Indian and Mexican labor. As most of the men were wards of the government, the cost of labor was reduced to the simple cost of living, or possibly a little over as an inducement for some extra exertions. I was instructed to limit the plant, as labor "was so cheap." However, before agreeing to this as the wisest course, I investigated the possibilities of output by the feeds at the same time and attempting to follow a curved or irregular line with the tool. It is often absolutely necessary to accomplish this feat of contortion when working on die or tool work. A good deal of observation, as well as personal experience, convinced me that something better would be very much appreciated, and the result is here shown.

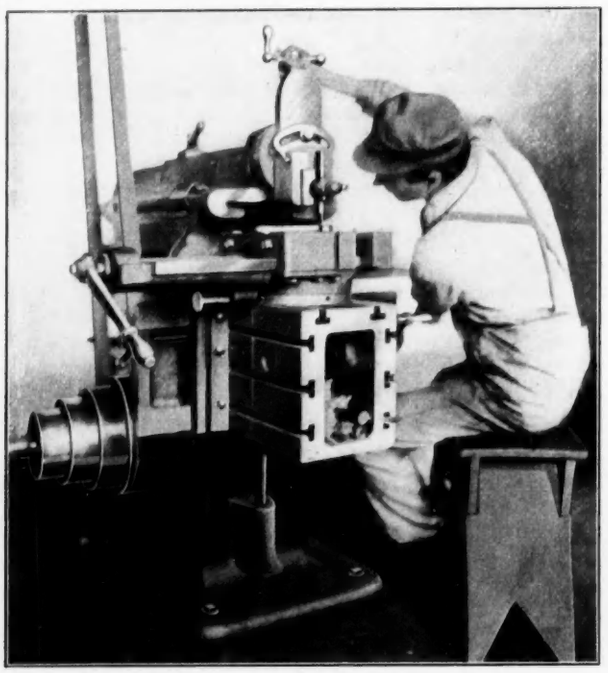


FIG. 1. THE OLD WAY OF FEEDING THE SHAPER.

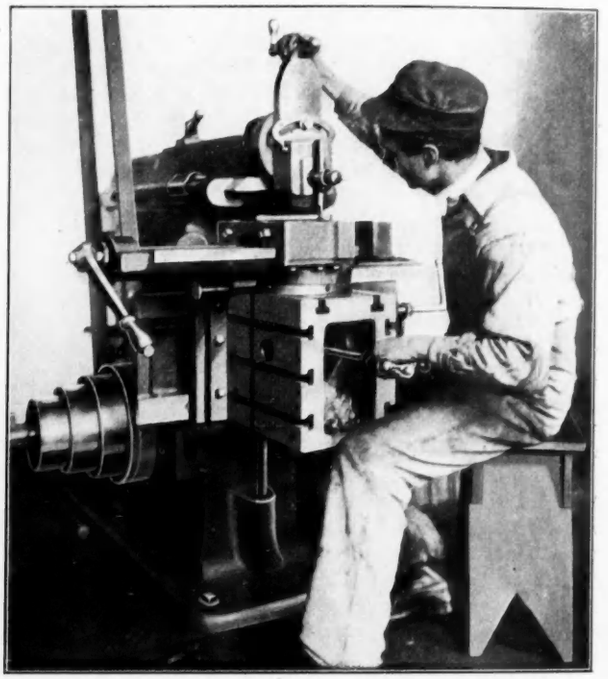


FIG. 2. THE IMPROVED WAY.

cheap labor as compared with what the same goods cost in the East, and to the astonishment of the syndicate I proved to them that cheapest labor wasn't to be considered when modern labor-saving devices were used. Taking a certain piece that was to be made, cheap labor turns out in six days twelve pieces; boys on machine in the East, 600 pieces.

Let us say it takes 10 cents per day to enable these people to exist; then the twelve pieces will cost if done by cheap labor, 60 cents, or 5 cents each. The boys in the East are paid from $3 to $6 per week. Let us put the figure at $6 per week; then the 600 pieces would cost made in the East with machines just 1 cent each. If there was added to this the maintenance of the plant it would, even then, not come to anything near what it would cost to allow cheap labor to go ahead in its old way. By the way, I omitted to say that these people were actually doing this work then by hand, and that is how I got their figures in this example.

JOHN G. NIEDERER.

An Auxiliary Hand Feed for the Shaping Machine.

Editor American Machinist:

The photo, Fig. 1, shows the position of a shaper operator when manipulating both

Fig. 2 shows the position of the operator when the machine is provided with the auxiliary feed. Fig. 3 shows the details, which will be readily understood. The only change necessary is to replace the solid nut with a rotatable nut, which is operated through the bevel gears by the handle, as clearly shown in the sketch.

No alteration is necessary for the cross-feed screw, power feed, or right-hand handle, merely adding a rotating nut to be operated by the left hand, which at present has nothing at all to do. The right hand is then always free to operate the vertical feed, it being thus possible to handle both simultaneously; or, if necessary, to make a considerable movement of the table, as in returning for a new cut, both the screw and nut can be rotated at the same time with the right and left hand respectively, thus securing a "double-quick" movement of the table.

This improvement on shaper feeds will put the shaper on a par with the engine lathe for convenience and quick manipulation. It is to be regretted that a planer cannot as easily be thus equipped.

Another point which builders of shapers have overlooked is the placing of the handles for changing the feeds; these should be so placed that they can be changed while the operator is seated and the machine running. On some shapers it is necessary to make several stops before the feed is adjusted properly, there being no marks to indicate the number of notches of feed, and in a few the indicator for length of stroke is also lacking. I notice a strong rivalry among the different manufacturers of milling machines to bring out improvements tending to convenience in

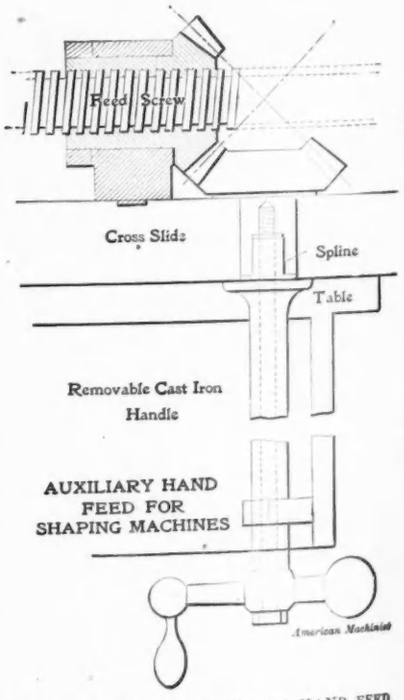


FIG. 3. DETAILS OF AUXILIARY HAND FEED.

the handling of these machines. A like spirit among the shaper builders cannot but be profitable.

GEO. J. MEYER.

Milwaukee, Wis.

Organization of The American Bridge Company.

The following is a list of the various bridge and structural concerns forming the American Bridge Company: American Bridge Works, Chicago, Ill.; Berlin Iron Bridge Company, East Berlin, Conn.; Buffalo Bridge and Iron Works, Buffalo, N. Y.; Carnegie Steel Company (Keystone Plant), Pittsburgh, Pa.; Edge Moor Bridge Works, Wilmington, Del.; Elmira Bridge Company, Elmira, N. Y.; Gillette-Herzog Manufacturing Company, Minneapolis, Minn.; Groton Bridge and Manufacturing Company, Groton, N. Y.; Hilton Bridge Construction Company, Albany, N. Y.; Horseheads Bridge Company, Horseheads, N. Y.; Lafayette Bridge Company, Lafayette, Ind.; Lassig Bridge and Iron Works, Chicago, Ill.; New Jersey Steel and Iron Company, Trenton, N. J.; New Columbus Bridge Company, Columbus, Ohio; Pittsburgh Bridge Company, Pittsburgh, Pa.; A. & P. Roberts Company (Pencoyd Iron Works), Pencoyd, Pa.; Post & McCord, Brooklyn, N. Y.; Rochester Bridge and Iron Works, Rochester, N. Y.; Schultz Bridge and Iron Works, Pittsburgh, Pa.; Shiffler Bridge and Iron Company, Pittsburgh, Pa.; Union Bridge Company, Athens, Pa.; Milwaukee Bridge Company, Milwaukee, Wis.; Wrought Iron Bridge Company, Canton, Ohio; Youngstown Bridge Company, Youngstown, Ohio.

The companies that manufacture bridge and structural work included in the consolidation have a combined capacity of 600,000 tons per annum. The Pencoyd plant, of the A. & P. Roberts Company, alone comprises one of the best and most complete rolling mills for structural material in existence, with a capacity of 200,000 tons per annum. The American Bridge Company is in a position to furnish all classes of bridge and structural work at minimum cost and in the shortest possible time, and this has been announced as its future policy. It is stated that no advance in prices will be made, but the cost of production will be reduced to an absolute minimum.

The directors of the company are as follows: Percival Roberts, Jr., Alfred C. Case, William H. McCord, Charles M. Jarvis, William H. Connell, Walter Hawxhurst, Charles Macdonald, Frank Conger, James P. Kennedy, Lewis S. Gillette, John F. Alden, Walter G. Oakman, J. P. Ord, Robert Winsor, Robert Bacon, Charles Steele, Paul E. DeFere, Robert S. Green, J. W. Walker, Abram S. Hewitt and August Belmont.

The following scheme shows the way in which the operations of this new organization are divided and systematized:

The executive organization is made up entirely of men of large experience, headed by Percival Roberts, Jr. Joshua A. Hatfield has been appointed as assistant to the president, and will also have charge of the sales of the rolling mill products of the Pencoyd plant.

The engineering department is in charge of Charles C. Schneider, formerly chief engineer of the Pencoyd Iron Works, of the A. & P. Roberts Company, with the title of vice-president in charge of engineering. Mr. Schneider has full charge of all questions of engineering, including the preparation of all plans, estimates and working drawings. All engineers of the company, whether engaged in the contracting, operating or erecting departments, are under him. At different localities throughout the country are stationed a corps of designing engineers to prepare preliminary plans and estimates, and at each plant will be located a full and complete corps of engineers and draftsmen to prepare plans for the work fabricated at that particular plant.

The operating department is in charge of Charles M. Jarvis, formerly president of the Berlin Iron Bridge Company, with the title of vice-president in charge of operating. As soon as contracts for any work are taken, they are immediately turned over to this department for execution, and consequently all the plants and erecting forces of the company belong in this department. At each plant is a manager, with full charge over all employees and the operations of that particular plant. Where a number of plants are closely located they are placed under one local manager, each plant being equipped with a superintendent. All managers are under the direct charge of the general manager, James P. Kennedy, formerly president of the Youngstown Bridge Company, who moves about among the various plants in order to see that all are working in one harmonious whole, and that each has the advantage of the experience of every other plant. The erecting is also in charge of the operating department, and this is under William Wennas as superintendent. Mr. Wennas has had full charge of all the Pencoyd erecting for a number of years, and gained a world-wide reputation but a short time ago for the economical and expeditious manner in which he handled the erection of the famous Atbara Bridge.

All the sales of the company are in charge of the contracting department. This is divided into three distinct parts: Railway contracting, highway contracting, structural contracting.

The railway contracting is in charge of Charles Macdonald, formerly president of the Union Bridge Company. The highway contracting is in charge of Frank Conger, formerly president of the Groton Bridge and Manufacturing Company, and the structural contracting is in charge of W. H. McCord, formerly of the Post & McCord Company. The preparation of all proposals and contracts is in charge of this department. The company has opened contracting offices in different parts of the country, each office reporting daily, by wire, to various members of the contracting department. The contracting department of the American Bridge Company is one of the most important, as here are made up the proposals and estimates, on all work.

The mechanical department has been made of equal importance with all other departments, and has been placed in charge of James Christie, formerly mechanical engineer of the Pencoyd plant, with the title of vice-president. The mechanical details of all the various plants belong to this department.

The financial department is in charge of William H. Connell, formerly president of the Edge Moor Bridge Works, as treasurer, with F. M. Wyant, formerly general manager of the Wrought Iron Bridge Company, and F. H. Schmidt, formerly secretary and treasurer of the Youngstown Bridge Company, as assistant treasurers.

The auditor of the American Bridge Company is Charles C. Price, formerly with the Pencoyd Iron Works, of the A. & P. Roberts Company.

The purchasing department is in charge of Francis W. Heisler, formerly purchasing agent for the Edge Moor Bridge Works, with headquarters at No. 259 South Fourth street, Philadelphia, Pa. The assistant purchasing agent is E. A. Muench, formerly purchasing agent for the A. & P. Roberts Company.

The secretary of the company is Douglas O. Morgan, formerly a member of the law firm of Seward, Guthrie & Steele.

Personal.

Professor Sweet has returned from the Paris Exposition.

The Standard Pneumatic Tool Company has recently opened offices in Pittsburgh, Pa., 217 Ferguson Building, with William Jennings in charge.

A. B. Holmes, who has been connected with the Standard Pneumatic Tool Company since its organization, has been appointed assistant manager, and will be at the Chicago office of the company.

Henry D. Sharpe, secretary of the Brown & Sharpe Manufacturing Company, and J. Henry Drury, of that company, sailed July 7 on the "Etruria." Lucian Sharpe has recently returned from Europe.

C. P. Wetmore, for the past year superintendent of the machine works of the F. B. Shuster Company, New Haven, Conn., has taken a position in the engineering department of the Russell & Erwin Manufacturing Company, at New Britain, Conn.

Obituary.

Julius F. Pratt, vice-president and treasurer of the Atlas Engine Works, Indianapolis, died July 6 at Glengariff, Ireland, where he had recently arrived in the course of a health and pleasure trip.

Charles Wesley Dickinson, inventor of

the geometric lathe used in bank note engraving, died at Belleville, N. J., July 3, seventy-seven years old. He was born in Springfield, N. J., and learned the machinist trade with Seth Boyden. Later, he became a watch-case maker, which turned his attention to the automatic production of geometric figures. The first of his machines for bank notes was used by the United States Government in 1862. He was in the employ of the Government for a year and a half, and his time since then had all been spent at his shop at Belleville.

An Engineer Wanted.

"The Locomotive" reprints the following *bona fide* ad. from a Minneapolis paper, and we take pleasure in passing it along:

"I want a man who can run a Shay Gear Lima engine for logging railroad; I don't want excuses, I want logs. I want a man who can climb into the firebox and caulk his flues with 60 pounds of steam on, and who can 'get there' without having a machine shop under the cab eaves. In short, I want an engineer who will not burn out the telegraph line with complaints to headquarters. Work in Wisconsin. Steady job with adequate pay to the right party."

The issue of "The Railway and Engineering Review" bearing date of June 16 is a notable number. It is a "portrait souvenir edition," and contains, first, an excellent full-page half-tone portrait of Mr. J. H. McConnell, president of the American Railway Master Mechanics' Association; then follows a page of portraits of past presidents of the association, and also those of the Master Car Builders' Association. Following these are separate portraits of the individual members of the two bodies, as far as they could be procured. The total number of portraits given is 400—all well and clearly reproduced. The usual make-up of the paper follows the twelve heavy leaves which carry the pictures.

The steam traction engines sent to South Africa from England have done some good service in the army movements. Two of the engines made a trip of 36 miles over exceedingly rough roads with three loaded wagons in 14 hours.

President Seth Low, of Columbia University, New York city, found recently that the twenty-four men employed in the boiler rooms and the electrical departments were working in twelve-hour shifts. He at once gave orders to put the men on eight-hour shifts without reducing their pay, and to employ more men. He says: "I am a firm believer in the justice and wisdom of an eight-hour day, and know of no better way than to put one's professions into practice where one has the power."

(Continued from page 26.)

ning with a limited payroll, and others have a good stock of castings ahead.

It is generally conceded here that the condition of the iron market is greatly responsible for the general lethargic conditions. Practically nobody is buying, and until the iron market finds its proper level there does not seem to be any very good prospect of a betterment of conditions. This is looked for by the first of the year at the latest. A consensus of opinion from the larger tool making establishments indicates that there is not a desire for the spasmodic rush of a year ago, and that they will be better satisfied with a substantial, steady condition of things. A talk with the heads of the larger concerns reveals the fact that there has been practically no reduction in the market price of tools, however true it may be that smaller concerns have made material discounts to move stock on hand. From an excellent authority it is learned here that there is at least $2,000,000 worth of expensive American made machine tools in German warehouses. This would indicate that the demand from the leading foreign markets is not likely to receive any great impetus within the year at least. The American Rolling Mill Company, an enterprise fathered by Cincinnati capitalists and men identified with the American Steel Roofing Company, of Cincinnati, is making preparations for an auspicious beginning. The company has designated Thursday, July 12, as the day for laying the corner stone for their big mills at Middletown, Ohio. It will be a holiday in the place and business will be suspended. The company will make open-hearth steel and black galvanized sheets. Concerning market conditions, the Cincinnati representatives of the company do not think that the present chaotic condition of the pig iron market will be permanent. It is thought that the price has about reached rock bottom, and as to the price of sheets, which is very low, it is reasoned that as the trust governs that market there need be no great apprehension from that quarter. The American Steel Roofing Company and the American Rolling Mill Company were consolidated recently, and on September 1 the factory of the former will be abandoned, to be established with that of the latter in Middletown. The entire plant is expected to be running by the first of October. Many of the Cincinnati machinery making concerns are taking advantage of the summer lethargy to institute the cleansing and renovating process. The local concerns dealing in machines and generators of electric power are doing a steady business, and there seems to be no diminution in demand for machines of that character.

CHICAGO MACHINERY MARKET.

A local machinery man who has just returned from Cleveland, Ohio, says he encountered among the machinery trade of that city a most optimistic view of the market. The prevailing sentiment was that business this year would be remarkably good, an opinion that seemed to be based upon the size and numbers of inquiries received. At Chicago opinion runs quite largely in the opposite direction. The volume of trade in machine tools at present is light. It is true that comparisons are made with one of the biggest months of last year, and this may account in part for the unfavorable comparison. But aside from that fact, there is undoubtedly a disposition among many buyers to wait before ordering tools. Inquiries are fairly numerous, but the orders do not follow with any notable rapidity. The tendency seems to be to reduce stocks, not only on the part of representatives here, but also among the makers of tools, to whom the current decline in iron and steel material is suggestive of somewhat cheaper production when the readjustment of values is completed. The continued activity in the factories under these conditions is pretty conclusive evidence that the machines now being built have an immediate market.

One of the largest orders placed at Chicago within the past few days was that of the Milwaukee Harvester Company for the equipment of its large new addition to its plant. Machinery to the value of more than $5,000 was purchased here, the orders being distributed among a number of the dealers. Much of this purchase consisted of machinery for the making of other machines, for the Milwaukee Harvester Company builds a large share of the special tools which its factory requires.

The railroad shops have been good buyeres recently of both iron and woodworking tools. The Berlin Machine Works have sold a number of tools to the Chicago, Milwaukee & St. Paul shops at Dubuque, Iowa, and Minneapolis, Minn.; also to the Chicago, Burlington & Quincy road for its shops at Hannibal, Mo. Another large order was received from the Armour Packing Company for the latter's new plant at Kansas City.

The Marshall & Huschart Machinery Company reports that business for June this year exceeded that for June, 1899, though July is starting in with trade more restricted. The Pratt & Whitney Company says that for the first six months of the year the Chicago trade exceeded that for the first half of 1899, but they also remark that the tendency is now towards the usual dullness of summer.

The current inquiries denote considerable business in prospect, but opinions differ as to when this will be placed. Trade may brighten up soon, or may be held in suspended animation until after the election, according to the diverse views held.

The Weber Gas and Gasoline Engine Company reports trade quite brisk. Among orders placed recently are three

engines for hoisting lead and zinc ores in the mines of Southwestern Wisconsin, said to be the first application of gas power to that particular field; also two gas engines of 125 aggregate horse-power for a cement works in central New York, which has found natural gas and will dispense with all steam power.

The Filer & Stowell Company sold recently to the National Steel Company for installation in the new steel mills at Youngstown, Ohio, a 4,000 horse-power Corliss engine. The company is running full and reports a large number of inquiries.

The Aultman & Taylor Company, Mansfield, Ohio, has enough orders booked to keep the shops running steadily until next November, notwithstanding the fact that the capacity of the shops was increased last year 50 per cent.

A. L. Ide & Sons have sold to the Illinois Central Railroad two tandem compound four-ported engines of 470 horse-power and one of 175 horse-power for installation in a new lighting plant to be erected in this city, to furnish light for all suburban stations now lighted by gas. The engines will be direct-connected for alternating current.

New Catalogs.

Dean Brothers Steam Pump Works, Indianapolis, Ind., send a special catalog, No. 38, of duplex steam pumping machinery. Size, 6x 7¼ inches.

The Industrial Water Company, 15 Wall street, New York, sends a catalog of its water softening and purifying apparatus. Size, standard, 6x9 inches.

The Goodwin Car Company, 96 Fifth avenue, New York, sends a pamphlet illustrating and describing its steel cars for handling all sorts of "dumpable" material. Size, 9¼x6 inches.

The Usines Bouhey, Societe anonyme, Paris, France, have published a catalog in French for the Exposition, of metal-working machine tools. They manufacture numerous types of these. Size, 5¼x8½ inches.

The Creamer Perfection Steam Specialties Company, 459 Avenue D, Bayonne, N. J., has issued a catalog of pump governors and receivers, balance steam traps, boiler feeders, balance valves, etc. Size, 5¼x6¾ inches.

The Sterlingworth Railway Supply Company, Easton, Pa., has gotten up a brief but aesthetic pamphlet showing some of the beauties of that town, and among them brake beams, bolsters and steel trucks. Size, 5½x7 inches.

The New Process Raw Hide Company, Syracuse, N. Y., sends its 1900 catalog of patent noiseless, solid raw hide spur, bevel and friction gears, also bushings, washers, raw hide bound mallets, etc. Size, 3¼x6¼ inches.

The Agricultural and Mechanical College of Texas, College Station, Tex., sends its twenty-fourth annual catalog. Besides agriculture and horticulture, there are courses in mechanical and civil engineering. Size, standard, 6x9 inches.

The Scranton Corundum & Emery Wheel Company, Scranton, Pa., sends a catalog of the wheels which it manufactures, also of emery grinding machines, twist drill grinder, saw sharpener, wheel dresser and polishing supplies. Size, 5½x7¼ inches.

The Sherwood Manufacturing Company, 34 and 36 Washington street, Buffalo, N. Y., sends a catalog, No. 7, of the "Sherwood" double-tube injectors, "Buffalo" automatic injectors, "Eagle" ejectors and "Buffalo" drive well ejectors. Size, 6x9¼ inches.

The J. M. Carpenter Tap & Die Company, Pawtucket, R. I., has sent us catalog, No. 13, of tools for cutting screw threads, including taps, dies, screw plates, die stocks, tap wrenches, etc. It is a convenient little priced catalog of 112 pages. Size, 3⅝x6 inches.

The Gardner Governor Company, Quincy, Ill., sends its catalog, No. 15, of duplex steam pumps, steam engine and pump governors, combination speed and pressure regulators, balanced lever valves, angle and globe stop valves, air compressors, etc. Size, standard, 9x6 inches.

The Bullock Electric Manufacturing Company got up a souvenir picture pamphlet for the late Master Mechanics' and Master Car Builders' conventions at Saratoga. There are views, among others, showing the company's motors attached to a dozen different machine tools. Size, standard, 6x9 inches.

The General Power Company, 100 William street, New York, sends a catalog of the Secor system kerosene oil motors for generating power for all purposes. The engines are listed in 10, 15 and 25 horse-power sizes, others being now constructed. The pamphlet is 4½x7 inches.

The Detroit Lubricator Company, Detroit, Mich., sends a catalog of sight-feed lubricators and other lubricating and steam specialties. The sight-feed lubricators shown include the styles required for all types of engines, except locomotives. Some hints on their care and operation are given. Size, standard, 6x9 inches. They make also locomotive lubricators.

Miscellaneous Wants.

Advertisements will be inserted under this head at 25 cents a line, each insertion. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded.

Gear Wheels, gear cutting. Grant; see p. 22.

Caliper cat. free. E. G. Smith, Columbia, Pa.

Forming lathes. Mer.Mach.T.Co.,Meriden,Ct.

Punches & dies. Wal.M.Wks.,Waltham,Mass.

Dies & punches. Amer. Hdw. Co., Ottawa, Ill.

Light and fine mach'y to order; models and elec. work specialty. E. O. Chase, Newark, N. J.

Book "Dies and Diemaking," $1, post paid. J.L.Lucas,Bridgeport,Ct. Send for index sheet.

F. J. Stokes Machine Co., 13th and Noble sts., Philadelphia, Pa., build light machinery.

Wanted—Several second-hand turret lathes for boring small castings. Address Box 305, Atlanta, Ga.

Selden Packing for Stuffing box, with or without rubber core. Randolph Brandt, 38 Cortlandt st., New York.

Wanted—Parties with facilities to manufacture medium and heavy high-grade machinery. Address "Phila.," care AM. MACH.

Gear and Milling cutters, adjustable reamers and special tools; vertical millers, cutter and surface grinder and shears. Catalog of small tools free. R. M. Clough, Tolland, Conn.

For packing rings that make a piston valve steam tight and nearly frictionless, that do not wear warmer, their groove wider, nor the seat larger at the port than elsewhere, write J. H. Dunbar, Youngstown, Ohio.

Institutions retiring from business having machine tools, brass and wood working machinery will find it to their interest to correspond with us. We purchase complete plants or handle them on com. C. C. Wormer Mach. Co., 55-59 Woodbridge st., W., Detroit, Mich.

Wants.

Situation and Help Advertisements only inserted under this head. Rate 25 cents a line for each insertion. About six words make a line. No advertisements under two lines accepted, and no advertisements abbreviated. The cash and copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded. Applicants may specify names to which their replies are not to be forwarded; but replies will not be returned. If not forwarded they will be destroyed without notice. Original letters of recommendation or other papers of value should not be inclosed to unknown correspondents.

Situations Wanted.

Draftsman on gas-engine work wishes to change. Box 140, AMERICAN MACHINIST.

Draftsman, 4 years' experience, technical graduate, wants position. Box 141, AM. M.

Experienced machinist and draftsman wants place; age 25; can handle men. Box 165, AMERICAN MACHINIST.

Mechanical engineer with large experience of hoisting engines (also general) seeks position as draftsman. Box 158, AMER. MACH.

Situation wanted by a first-class toolmaker, on jigs, fixtures and gage work; 16 years' experience on interchangeable parts. Address Box 157, AMERICAN MACHINIST.

Experienced designer and shop manager on steam and gas engines, also special and automatic machinery, desires position; New York or vicinity. "X.," AMERICAN MACHINIST.

Wanted—Situation as foreman machinist, by one having a broad experience with engines, governors, pumps, piping, dynamos and general repairing. "Indicator," care AM. M.

Position wanted as head foreman by thorough mechanic, used to general machinery, dynamos, tools; tools designed for interchangeable work. Address Box 163, AM. M.

Foreman toolmaker with technical education and considerable experience on light machinery, stamping, hardware, etc., wants responsible position, vicinity Indiana. Box 156, AMERICAN MACHINIST.

A thorough, up-to-date machinist of practical inventive ability, well experienced, good draftsman, systematic, used to take charge, wants suitable position to make full use of his ability. Box 164, AMERICAN MACHINIST.

Mechanical engineer, Dutchman, 25, 5 years' college (graduate), 3 years' shop and 1 year's drawing-office experience, wants position in the United States; speaks and writes English, French and German. Address D. A., AMERICAN MACHINIST.

Mechanical engineer with many years of shop practice offers his services to a larger manufacturing concern, where skill and economy are appreciated; best references; Chicago preferred; expert on condensing plant. Box 159, AMERICAN MACHINIST.

Designer automatic machinery, inventive ability, 8 years' experience intricate designing and supervising shop work, technical graduate '92, desires position to work up inventions or as head draftsman; N. Y. City preferred. Box 109, AMERICAN MACHINIST.

Position as superintendent or general manager of machine works desired by practical man now holding responsible position; fully understands handling help and can furnish highest references; New York or vicinity preferred. Address Box 166, AMER. MACHINIST.

Wanted—By a practical mechanic, a position as manager of a factory consisting of foundry, machine shop, etc.; thorough practical knowledge of up-to-date methods in general manufacturing; extensive experience as an expert in modern factory organization. Box 143, AMERICAN MACHINIST.

Position as traveling salesman; 15 years' experience; 6 years with present concern; would fit into any mechanical line; accustomed to closing large contracts; can earn salary or quit; salary $3,000 and expenses; can sell anything that's good; don't want to sell anything else. Box 120, AMER. MACH.

Toolmaker and machinist of ability and long experience wishes position, preferably as foreman or superintendent; expert on labor-saving tools and up-to-the-minute methods of doing things; good draftsman; accustomed to handling men on first-class work so as to get quick results at small cost. Box 155, AMERICAN MACHINIST.

Help Wanted.

Wanted—First-class draftsman on engine work. The Ball & Wood Co., Elizabeth, N. J.

First-class leading machinist to look after small shop; give full particulars, age, wages. Box 154, AMERICAN MACHINIST.

Wanted—Good general draftsman for shop in Brooklyn; state experience and general qualifications. Box 162, AMER. MACHINIST.

(Continued on page 48.)

Manufacturers.

A new knitting mill factory building will be erected at New Cumberland, Pa.

Jansen & Zoeller, Pekin, Ill., have the contract for the brickwork on a large glucose factory at that place.

It is rumored that Boston and English capitalists are contemplating the erection of a $2,000,000 steel plant near Richmond, Va.

The Winkley Company, manufacturers of dust-proof oil-hole covers, will remove from Madison, Wis., to Hartford, Conn., July 15.

It is reported that the Carnegie Company will spend $2,500,000 more in enlargements than was originally intended, or $10,000,000 in all.

The shoe factory of King Brothers, Abington, Mass., was destroyed by fire July 1. Loss, $30,000. The firm will rebuild as soon as possible.

The American Flint Glass Workers' Union will establish a co-operative glass factory in Fairmount, Ind. James Morrison, of Anderson, will be the manager.

Belding Brothers & Co., Belding, Mich., are to erect a large new silk factory at that place. The town named has voted to buy a ten-acre tract for park and waterworks purposes.

The project of forming a stock company and raising $10,000 for erecting a new factory building for the Geyers & Ray Rug Company, at Freehold, N. J., has taken definite shape.

Samuel McElwee, door and sash manufacturer of Doaktown, N. B., has removed to Derby Junction, where he is building a factory for the purpose of manufacturing building material.

The American Flint Bottle Company will locate a factory, with a capacity of thirty-six blowers, at Summitville, Ind., to be in operation by September. Free gas and track privileges are furnished.

Architects Brown & Von Beren, New Haven, Conn., are preparing plans for a new factory building to be erected on Little Orange street. It will be 60x140 feet, two stories high. A freight elevator will be installed.

Improvements, with the estimated cost of $150,000, are under way at the works of the American Writing Paper Company, at Windsor Locks, Conn. They include a steel stack and evidently a good deal of new machinery.

The Royer Wheel Company, of Cincinnati, manufacturer of carriage wheels, is looking for a new factory site. A committee selected by the Commercial Club of Indianapolis will explain the advantages of that city to the members of the company.

The Brighton Mills, manufacturers of cotton goods and looms, Twenty-third street, near Tenth avenue, New York, will, it is said, erect a new cotton goods mill at Passaic, N. J., to cost $90,000 and with an initial outfit of machinery to cost $250,000.

An Allentown (Pa.) syndicate bought the farms of Llewellyn Mohr and William Mohr and the Mohr estate, near Fogelsville, Pa., on which there is a fine quality and deposit of cement rock, and works for the manufacture are to be erected in the near future.

The Canfield (bicycle) Brake Company will start a shop about August 1, on the second floor of Heermans & Lawrence's machine shop at Corning, N. Y. The demand for the brake is increasing so rapidly that they expect to require larger quarters before long.

The Thayer Milne Company, of Philadelphia, has bought twelve acres of the Thatcher estate at Darby, Pa., and will erect a large soap factory near Darby creek. It is also reported that a big agricultural firm is nego-

(*Continued on page 49.*)

Help Wanted—Continued.

Wanted—An experienced toolmaker on tools for brass and iron work; state age, experience and wages expected. Box 147, A. MACH.

Wanted—First-class iron foundry foreman, experienced on valve and hydrant work; state age, experience and wages expected. Box 139, AMERICAN MACHINIST.

Machinist contractor wanted to handle about 75 men; one acquainted with steam, oil and gas engines preferred. T. M. D., AMERICAN MACHINIST.

Wanted—A draftsman, experienced on water-works valves and hydrants. Write, stating age, experience and salary expected, Box 148, AMERICAN MACHINIST.

Foundry foreman; one who can take charge of 150 men and produce results; state experience, salary wanted and age. Address "Ohio," care AMERICAN MACHINIST.

Wanted—A pattern maker who can make both wood and metal patterns for stripping plates; experience with globe valves desirable. Address Box 160, AMERICAN MACHINIST.

Expert layer-out for boiler shop; one accustomed to laying out intricate work from blueprints. Address, giving age, experience and salary expected, L. O., care AM. MACH.

Wanted—A few first-class machine hands for vertical or horizontal boring machine and large lathe, for up-to-date shop in western New York. Address Box 137, AMER. MACH.

Wanted—An instructor in mechanical engineering; shop and drawing-room experience, also diploma from technical school, required. Address, stating qualifications, age, etc., Box 153, AMERICAN MACHINIST.

Wanted—Man to take charge of die department, who is experienced in handling men and in the construction of sheet metal working dies, by a concern in large town in western New York. Address "Folsom," care AM. M.

We are enlarging our works, and will shortly require an increased number of skilled mechanics; we invite application from pattern makers, molders and machinists. Address the Westinghouse Machine Company, East Pittsburgh, Pa.

Wanted—A first-class mechanic as foreman; must have thorough knowledge of gear cutting in all its branches and be able to get out work rapidly and economically; this is a permanent position at good wages for the right man. Address Box 152, AMER. MACH.

Foreman boiler maker, by a shop employing about 150 men; man must have complete knowledge of all details, and be able to handle men to good advantage; good salary to right man. Give age, reference and salary expected to F. B. M., care AMER. MACHINIST.

We can use on heavy boring machines, planers and large lathes several first-class machinists who can and will make these machines do all they were designed to do; unless you can earn 30 or more cents per hour do not apply. Gates Iron Works, 650 Elston ave., Chicago.

We have an opening for several bright young men, operating special wet grinding machines; should have some knowledge of machinery, but not necessarily machinists; pay of journeymen machinists after proficiency is attained; location in small country N. E. town; state experience. Box 161, AMERICAN MACHINIST.

Wanted—Foreman for toolroom in machine shop located in Western Pennsylvania, employing 125 men on high-grade gas and steam engine work; must be capable of designing jigs and tools for economical, rapid and accurate work, where all parts are made interchangeable; state age, experience and salary desired; references required. Address "Improvement," care AMERICAN MACHINIST.

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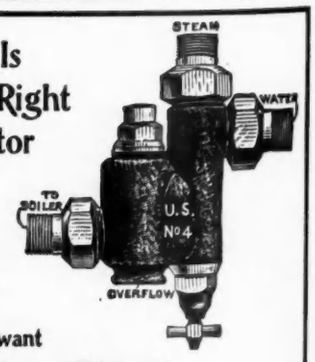

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